OMRON

Digital Heater Element Burnout Detector

K8AC-H

User's Manual

Cat. No. N159-E1-01

Preface

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.
This manual describes the functions, performance, and application methods needed for optimum use of the K8AC-H.
Please observe the following items when using the K8AC-H.

- This product is designed for use by qualified personnel with a knowledge of electrical systems.
- Read this manual carefully and make sure you understand it well to ensure that you are using the K8AC-H correctly.
- Keep this manual in a safe location so that it is available for reference when required.

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Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.

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Precautions for Safe Use

The following precautions are essential to ensure safety. Always heed these precautions.

1. Do not use or store the Product in the following locations.
- Outdoors or in locations subject to direct sunlight, wind, or rain
- Locations subject to dust, metal powder, or corrosive gases (in particular, sulfuric or ammonia gas)
- Locations subject to static electricity or noise
- Locations subject to flooding or exposure to oil

2. Use DIN Track for installation and mount the Product in the correct direct direction.
3. Do not touch the terminals when power is being supplied. Electric shock may occasionally occur.
4. Be sure you understand the contents of the Instruction Sheet and User's Manual and handle the Product according to the instructions provided.
5. Check all terminal numbers and polarity when wiring and wire all connections correctly.
6. Tighten terminal screws to the following torque.
Power supply terminals:0.5 N·m
7. Use the Product within the specified temperature and humidity ranges.
8. Do not use the product in locations subject to flammable or explosive gases. Explosions may occasionally occur if the Product is used in such locations.
9. Do not install the Product in any way that would place a load on it.
10. Use the Current Transformer specified by OMRON.
11. Install an external switch or circuit breaker that complies with applicable IEC60947-1 and IEC60947-3 requirements and label it clearly so that the operator can quickly turn OFF the power.
12. The product must be handled by personnel who have knowledge of electrical systems.

Precautions for Correct Use

The following precautions are essential to ensure correct use. Always heed theseprecautions.

1. Do not use the product in the following locations.
- Please subject to radiant heat from heat genetating devices.
- Plesse subject to vibration or physical shocks.

2. Make sure to use setting values approriate for the controlled object. Failure to do so can cause unintended operatin, and may result in accident or corruption of the prodct.
3. Do not use thinner or similar solvent for cleaning. Use commercialalcohol.
4. When discarding, prperly dispose of the product as industrial waste.
5. To measure correct values, perform aging for aproximatelr 15 minutes.
6. Only use this product within a board whose structure allows no possibillity for fire to scape.

Installation

1. When wiring, use only recommended crimp terminals.
2. Do not block areas around the product for proper dissipation of heat. (If you do not secure space for heat dissipation, life cyccle of the product will be compro mised.)

Noise Countermeasures

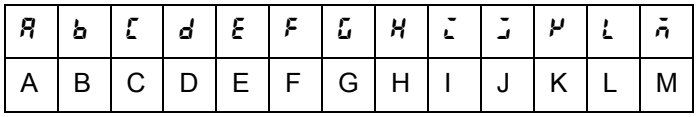
1. Do not install the product near devices generating strong high frequency waves or surges.

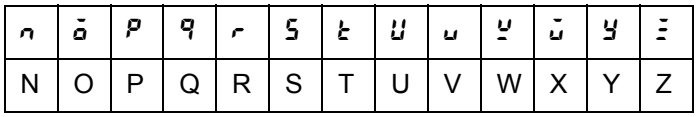
2. When using a noise filter, check the voltage and current and install it as close to the product as possible.

3. In order to prevent inductive noise, wire the lines connected to the product separa tely from power lines callying high voltges or currents. Do not wire in parallel with or currents. Do not wire in parallel with or on the same cable as power lines.
Other measures for reducing noise incude running lines along separate ducts and sing shield lines.

Setting Date Notation

The letters of the alphabet in settings data are displayed as shown below.

												
A	B	C	D	E	F	G	H	I	J	K	L	M

												
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Revision History

The revision code of this manual is given at the end of the catalog number at the bottom left of the front / back cover.

Revision code	date	Revision description
-	May 2008	First edition
01	November 2013	Added and changed functions

Related Manuals

The structure of the manuals related to the K8AC-H is as follows. Please use them for your reference.

■ K8AC-H

Man.No.	Model	Manual Name	Use	Description
N159-E1 (this Manual)	K8AC-H21_ _ K8AC-H22_ _ K8AC-H23_ _	User's Manual for K8AC-H Digital Heater Element Burnout Detector	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of the K8AC-H	The following details about K8AC-H are described. • Outline/features • Design of system configuration • Mounting/wiring • Setting of serial communications • Troubleshooting

■ PLC-related (CJ2 Series)

Man.No.	Model	Manual Name	Use	Description
SBCA-349	CJ2H-CPU_ _-EIP	User's Manual - Hardware – for CJ2 Series	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of CJ2 Series	The following details about the PLC unit of CJ2 Series are described. • Outline/features • Design of system configuration • Mounting/wiring • I/O memory allocation • Troubleshooting Use in conjunction with the User's Manual - Software - (SBCA-350).
SBCA-350	CJ2H-CPU_ _-EIP	User's Manual - Software- for CJ2 Series	Useful for information on the functions of CJ2 Series	The following details about the PLC unit of CJ2 Series are described. • Programming • Task function • File memory function • Various functions Use in conjunction with the User's Manual - Hardware - (SBCA-349).
SBCA-351	CJ2H-CPU_ _-EIP CS1G/H-CPU_ _H CS1G/H-CPU_ _-V1 CS1D-CPU_ _H CS1D-CPU_ _S CJ1G/H-CPU_ _H CJ1M-CPU_ _ CJ1G-CPU_ _	Command Reference Manual for CJ2 Series/CS/CJ SeriesCS/CJ	Useful for information about instruction words	The details about instruction words are described. Use in programming in conjunction with the following User's Manuals. • CJ2 Series User's Manual - Hardware - (SBCA-349), User's Manual - Software - (SBCA-350) • CS Series User's Manual - Setup - (SBCA-301), User's Manual - Programming - (SBCA-313) • CJ Series User's Manual - Setup - (SBCA-312), User's Manual - Programming - (SBCA-313)

■ PLC-related CS/CJ Series)

Man.No.	Model	Manual Name	Use	Description
SBCA-301	CS1G/H-CPU_ _H CS1G/H-CPU_ _-V1 CS1D-CPU_ _H CS1D-CPU_ _S	User's Manual - Setup - for CS Series	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of CS Series	The following details about the PLC unit of CS Series are described. • Outline/features • Design of system configuration • Mounting/wiring • I/O memory allocation • Troubleshooting Use in conjunction with the User's Manual - Programming - (SBCA-313).
SBCA-312	CJ1G/H-CPU_ _H CJ1M-CPU_ _ CJ1G-CPU_ _	User's Manual - Setup – for CJ Series	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of CJ Series	The following details about the PLC unit of CJ Series are described. • Outline/features • Design of system configuration • Mounting/wiring • I/O memory allocation • Troubleshooting Use in conjunction with the User's Manual - Programming - (SBCA-313).
SBCA-313	CS1G/H-CPU_ _H CS1G/H-CPU _ _-V1 CS1D-CPU_ _H CS1D-CPU_ _S CJ1G/H-CPU_ _H CJ1M-CPU_ _ CJ1G-CPU_ _	User's Manual Programming for CS/CJ Series	Useful for information on the functions of CS/CJ Series	The following details about the PLC unit of CS/CJ Series are described. • Programming • Task function • File memory function • Various functions Use in conjunction with User's Manual - Setup (CS Series: SBCA-301, CJ Series: SBCA-312).
SBCA-302	CS1G/H-CPU_ _H CS1G/H-CPU _ _-V1 CS1D-CPU_ _H CS1D-CPU_ _S CJ1G/H-CPU_ _H CJ1M-CPU_ _ CJ1G-CPU_ _	Command reference Manual for CS/CJ Series	Useful for detailed information on instruction words	The details about instruction words are described. Use in programming in conjunction with User's Manual - Setup- (CS Series: SBCA-301, CJ Series: SBCA-312), User's Manual - Programming - (SBCA-313).
SBCA-304	CS1G/H-CPU_ _H CS1G/H-CPU _ _-V1 CS1D-CPU_ _H CS1D-CPU_ _S CS1W-SCB_ _-V1 CS1W-SCU_ _-V1 CJ1G/H-CPU_ _H CJ1M-CPU_ _ CJ1G-CPU_ _ CJ1W-SCU_ _-V1	Communication Command Reference Manual for CS/CJ Series	Useful for detailed information on communication commands addressed to the CPU unit of CS/ CJ Series	The details about 1) C mode commands and 2) FINS commands are described. Refer to this manual for detailed information on communication commands addressed to the CPU unit (C mode commands or FINS commands). Note: Communication commands listed in this Manual are communication commands addressed to the CPU unit, regardless of their communication routes. (Serial communication port for the CPU unit, communication port for serial communication board/unit, or via communication unit, etc.) For commands addressed to the high-performance I/O unit or high-performance CPU unit, please refer to the User's Manual of each unit.

Man.No.	Model	Manual Name	Use	Description
SBCD-300	CS1W-SCB_ _-V1 CS1W-SCU_ _-V1 CJ1W-SCU_ _-V1	User's Manual for Serial Communication Board/Unit	Useful for information about the functions of the serial communication board/unit (hardware, serial communication mode) Useful for information about the standard system protocol to connect with Omron components	The details about 1) hardware/software for the serial communication board and serial communication unit and 2) the standard system protocol are described. Note1: when issuing a communication command using the communication port for the serial communication board/unit in upper-level link mode (signaling function included), refer to the Communication Command Reference (SBCA-304). Note2: For detailed information on user-created protocol macro function, please refer to the CX-Protocol Operation Manual (SBCA-307).

■ PLC-related (CP Series)

Man.No.	Model	Manual Name	Use	Description
SBCA-340	CP1H-X40D_-_ CP1H-XA40D_-_ CP1H-Y20DT-D	User's Manual for CP Series CP1H CPU Unit	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of CP Series	The following details about the PLC unit of CP Series are described • Outline/features • Design of system configuration • Mounting/wiring • I/O memory allocation • Troubleshooting Use in conjunction with the Programming Manual (SBCA-341).
SBCA-345	CP1L-L10D_-_ CP1L-L14D_-_ CP1L-L20D_-_ CP1L-M30D_-_ CP1L-M40D_-_ CP1L-M60D_-_	User's Manual for the CP1L CPU Unit of CP Series	Useful for information on the basic specifications such as overview/ design/mounting/maintenance of CP Series	The following details about the PLC unit of CP Series are described. • Outline/features • Design of system configuration • Mounting/wiring • I/O memory allocation • Troubleshooting Use in conjunction with the Programming Manual (SBCA-341).
SBCA-341	CP1H-X40D_-_ CP1H-XA40D_-_ CP1H-Y20DT-D CP1L-L10D_-_ CP1L-L14D_-_ CP1L-L20D_-_ CP1L-M30D_-_ CP1L-M40D_-_ CP1L-M60D_-_	Programming Manual for the CP1H CPU Unit of CP Series	Useful for information on programming of CP Series	The following details about the PLC unit of CP Series are described. • Programming • Task function • Details about instruction words

Table of Contents

Preface I
Terms and Conditions Agreement II
Precautions for Safe Use IV
Precautions for Correct Use IV
Revision History VII
Related Manuals VIII

Section 1 Overview 1-1
1.1 Main K8AC-H Functions 1-2
1.2 Model Number Structure 1-7
1.3 Input/Output Circuit 1-8
1.4 Nomenclature and Operations 1-12

Section 2 Preparation 2-1
2.1 Mounting 2-2
2.2 Terminal Arrangement 2-4

Section 3 Usage Example 3-1
3.1 External Connection Example 3-2
3.2 Heater Connection Methods and Current 3-7
3.3 Rate of Change for Currents with Parallel Heaters 3-8

Section 4 Initial Setup 4-1
4.1 ON/OFF Control 4-2
4.2 Phase Control 4-4
4.3 Cyclic Control 4-6

Section 5 Operation 5-1
5.1 Modes 5-3
5.2 Moving between Modes 5-4
5.3 Parameters 5-6
5.4 Setting the Parameter 5-11
5.5 Measurement Display 5-12
5.6 Compensation of Processing Value Display 5-18
5.7 Reset of Measurement Monitor Values 5-20
5.8 Alarm Indicators 5-22
5.9 Test Function 5-23
5.10 Setting Protection Function 5-25
5.11 Selecting Burnout Alarm Set Values 5-27
5.12 Selecting Voltage Fluctuation Compensation Standard Value 5-30
5.13 All Initialization 5-32
5.14 Set Value Initialization 5-34
5.15 Processing Value Initialization 5-36
5.16 Setting of Alarm Hysteresis 5-38

5.17 Setting of Gate Input Function 5-40
5.18 Setting of Voltage Fluctuation Compensation Function 5-42
5.19 Setting of Startup Lock Time 5-44
5.20 Setting of Output ON Delay Time 5-46
5.21 Setting of Soft Startup Time 5-48
5.22 Setting of SSR Short Circuit Detection Function 5-50
5.23 Setting of SSR Open Circuit Detection Function 5-52
5.24 Setting of Heater Layer Short Circuit Detection Function 5-54
5.25 Setting of Heater Layer Short Circuit Alarm Level 5-56
5.26 Selection of Heater Control Method (Only for phase and cyclic control type K8AC-H2_ _P_) 5-58
5.27 Setting of Switch Display 5-60
5.28 Setting of Power Save Mode 5-62
5.29 Setting of Power Save Mode Standby Time 5-64
5.30 Setting of Display Mode 5-66
5.31 Setting of Display Refresh Time 5-69
5.32 Setting of Unit Number 5-71
5.33 Setting of Baud Rate 5-73
5.34 Setting of Data Length 5-75
5.35 Setting of Stop Bits 5-77
5.36 Setting of Parity Bit 5-79
5.37 Setting of Gate OFF Alarm Output Hold Time (Only for ON/OFF control type heaters ; K8AC-H2_ _C_) 5-81
5.38 Setting of Operation Gate Current Level (Only for phase or cyclic control type heaters: K8AC-H2_ _P_) 5-83
5.39 Setting of Number of CT Passes 5-85
5.40 Setting of CT Ratio 5-87
5.41 Setting of Number of Effective Digits to be Displayed after the Decimal Point. 5-89
5.42 Setting SSR ON Delay 5-91
5.43 Setting SSR Operation Gate Current Level (Only for phase or cyclic control type heaters: K8AC-H2_ _P_) 5-93
5.44 Setting Cycle Time (Only for cyclic control type heaters: K8AC-H2_ _P_) 5-95

Section 6 Serial Communications Function 6-1
6.1 Communications Method 6-2
6.2 Frames 6-4
6.3 FINS-mini Text 6-7
6.4 Variable Areas 6-9
6.5 Reading the Variable Area 6-10
6.6 Writing to the Variable Area 6-12
6.7 Operation Commands 6-14
6.8 Setting Areas 6-16
6.9 Commands and Responses 6-17
6.10 Variable Area Map 6-21
6.11 Program Examples 6-23

Section 7 Troubleshooting 7-1

7.1 Error Display....7-2
7.2 Troubleshooting....7-3

Appendices A-1
Specifications A-2
Parameter List A-6

Section 1 Overview

This Section introduces the overview of the distinctive functions and names of each component of the K8AC-H.

1.1 Main K8AC-H Functions 1-2
1.2 Model Number Structure 1-7
1.3 Input/Output Circuit 1-8
Input Circuit/Output Circuit/Internal Block Diagram
1.4 Nomenclature and Operations 1-12

1.1 Main K8AC-H Functions

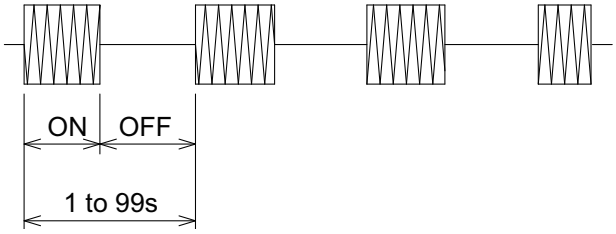
■ Main functions

The K8AC-H is a digital heater element burnout detector that detects heater burnout by measuring the heater current from various power supply systems.
Check for normal operation by using actual power supply units with the actual load before installing the K8AC-H in the environment.
The K8AC-H provides the following functions.

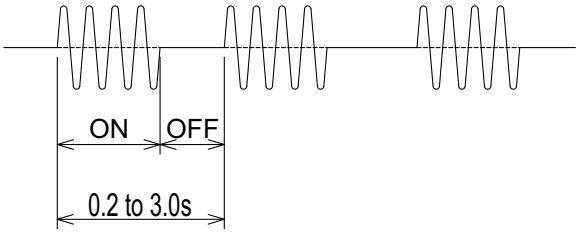
Applicable heater control methods

The following heater control methods can be used.

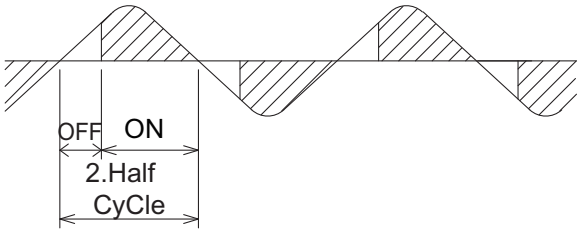
・ ON/OFF Control (Contactor/SSR)



・ Cyclic Control

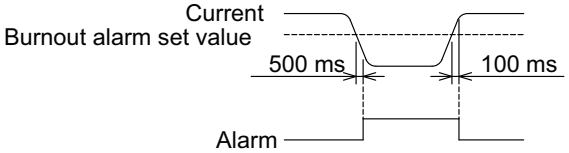


・ Phase Control (Applicable to three-arm power regulators controlled by 4 to 20 mA input)



Heater Burnout Alarm

The preset burnout detection value is compared with the heater current and an alarm is output accordingly.



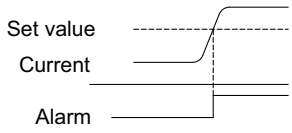
Transistor output models: ALM indicator lit, ALM transistor output
Relay output models: ALM indicator lit, OR of all detection status output.

Error Detection

The following errors are detected according to status.

・ Heater Layer Short Circuit Detection (overcurrent detection).

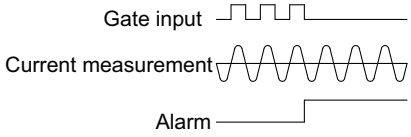
Layer short circuits can be detected in the heater. The preset overcurrent detection set value is compared with the heater current and an alarm is output accordingly.



Transistor output models: ALM indicator lit, ALM transistor output
Relay output models: ALM indicator lit, OR of all detection status output.

・ SSR Short Circuit Detection

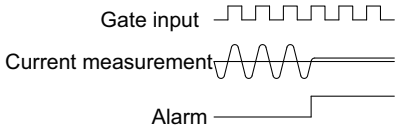
If current is measured when there is no gate input, an SSR short circuit error is detected and an alarm is output.



Transistor output models: SSR indicator lit, SSR transistor output
Relay output models: SSR indicator lit, OR of all detection status output.

・ SSR Open Circuit Detection

If current is not measured during gate input, an SSR open circuit error is detected and an alarm is output.



Transistor output models: SSR indicator lit, SSR transistor output
Relay output models: SSR indicator lit, OR of all detection status output.

Voltage Fluctuation Compensation

The voltage fluctuation compensation function automatically adjusts the burnout alarm operation value of the K8AC-H according to voltage fluctuations in the heater circuit. The operating value for burnout detection when multiple heaters are connected is set very close to the normal value. Thus, a false burnout alarm output will occur if there is a voltage drop in the heater circuit.
The voltage fluctuation compensation function prevents this type of false output.

<Example> Voltage drop from 100 V to 95 V in the heater circuit

Conditions : Voltage fluctuation compensation standard value = 100 V
Burnout alarm set value = 10.0 A

If the power supply voltage drops from 100% to 95%, the operating value will also be reduced from 100% to 95%.

Burnout alarm operating value = 10.0 A × 95% = 9.5 A

Gate Input

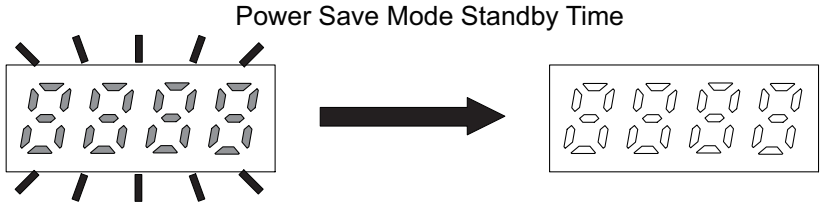
The gate input provides a sync signal used to link burnout detection to the control output of the temperature controller.

- SSR control: The voltage output pulse from the temperature controller is input.
- ON/OFF control: 24 VDC linked to a relay contact of the temperature controller is input.
- Cyclic or phase control: 4 to 20mA control signal is input.
- Heater element burnout detector with no gate input: A heater burnout alarm would be falsely output when the voltage output pulse from the temperature controller turns OFF. There would be no way to tell whether it was a false output .

Note: The gate input function can be turned ON or OFF as desired. If it is turned OFF, Heater Element Burnout Detector operation will not be linked to the temperature controller control signal. This only works as a simple undercurrent detection relay.

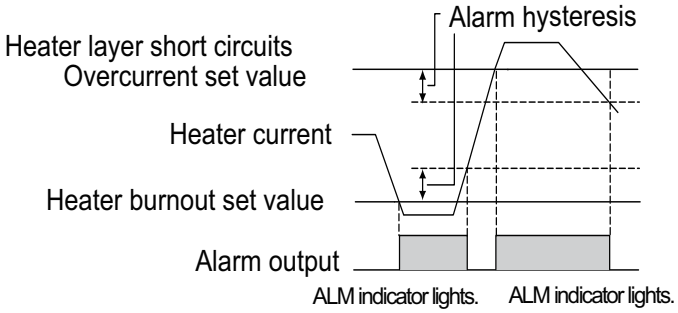
Power-saving Operation

If there are no key operations performed within a preset time period, the display automatically turns OFF.

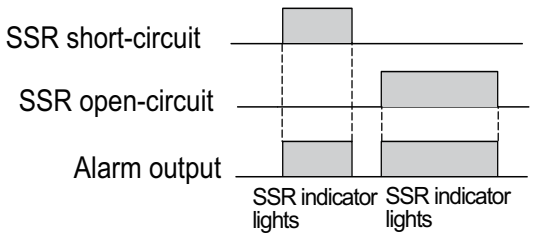


Output Operation Time Charts

- Heater burnout and heater layer short circuit (overcurrent) alarm



- SSR short/open circuit alarm



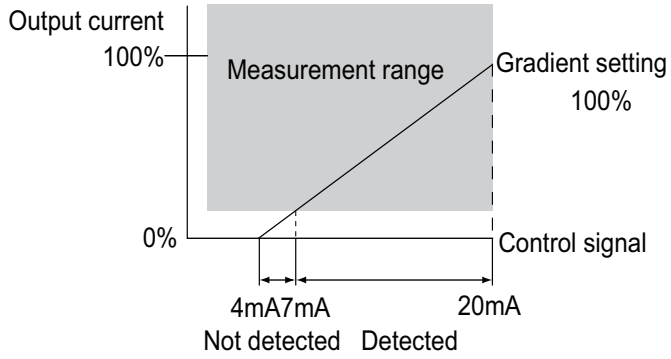
Operation Gate Current Level

The operation gate current level is a function to set the gate current value for which detection is disabled.

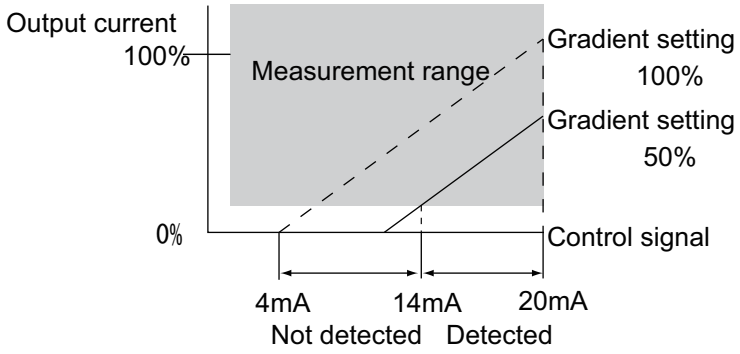
When performing the gradient setting for the power conditioner, the operation gate current level can be set to prevent false operation involving the gradient setting for the power conditioner. The relationship between the gradient settings and output current depends on the power regulator manufacturer and model, so be sure to check the characteristics of the power regulator being used before setting.

∗ Setting Example

Initial setting (7 mA)



When the power regulator's gradient settings are changed, the operation gate current level is set to so that the output current is within the measurement range.(In the following diagram, 14mA is set.)



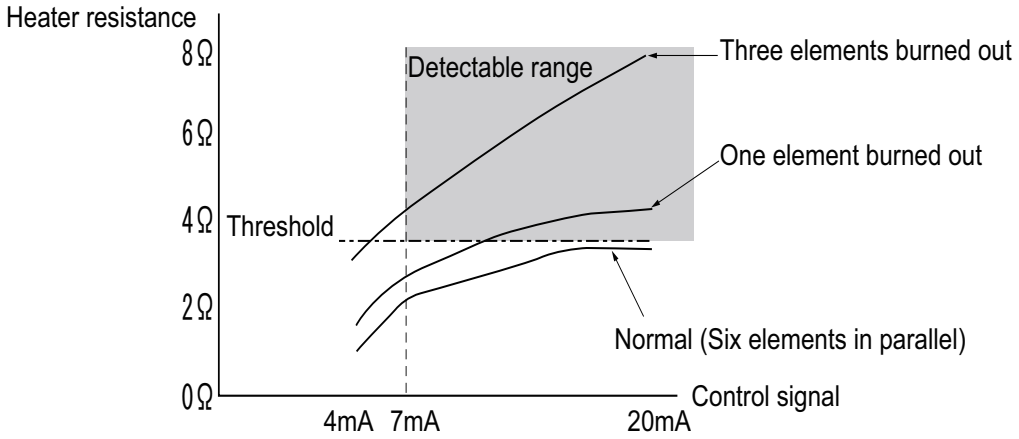
Note: When halogen heaters or other pure metal heaters are phase-controlled using a heater with varying resistance values such as halogen heater in phase / cyclicontrol, the heater resistance fluctuates according to the control level.

As a result, high-precision detection of heater burnout is not possible. The effect on the heater and setting methods depends on the heater being used.

Therefore, consult with your OMRON representative before using a heater with varying resistance values.

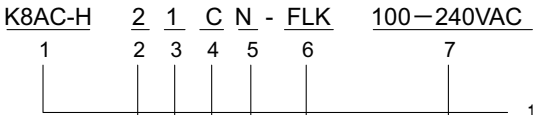
∗ Halogen heater resistance fluctuation example

In the following example, burnout of one element in a six-element heater can be detected at a control level of 20 mA, but detection is not possible due to effect of fluctuating resistance if the control level is any lower.



Note: The K8AC-H is designed to detect the disconnection of a load close to a pure resistance (e.g. electric wire heater).

1.2 Model Number Structure



1 Basic Model

Code	Series
K8AC-H	Digital Heater Element Burnout Detector

2 Product Type

Code	Product Type
2	Screw-less clamp terminals (power input: screw terminals)

3 Current Input Range

Code	Current range (special CT)
1	0.200 to 2.200 A （K8AC－CT20S,CT20L）
2	2.00 to 22.00 A （K8AC－CT20S,CT20L）
3	20.0 to 200.0 A （K8AC－CT200）

4 Heater Control Type

Code	Control type
C	ON/OFF control (SSR or contactor)
P	Phase control or Cyclic control

5 Output Type

Code	Output Type
N	Transistor outputs (Two outputs: either NPN open-collector output or PNP equivalent output can be used.)
C	Contact output (one SPDT relay contact output)

6 Communications Specifications

Code	Communications specifications
FLK	RS-485 (Two-wire half duplex transmission)

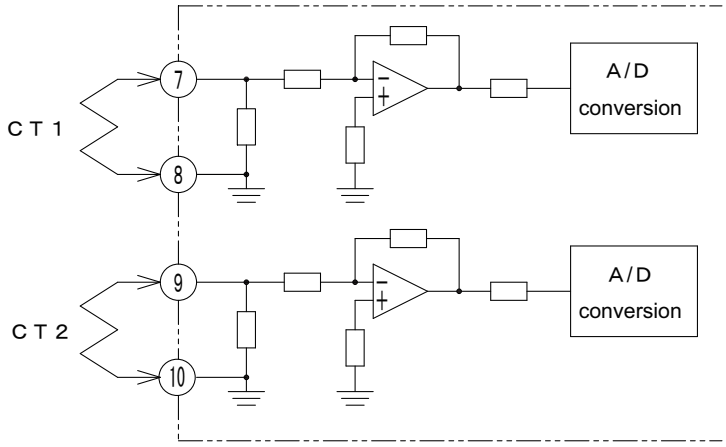
7 Power Specifications

Code	Power specifications
100－240 VAC	100 to 240 VAC（50/60 H z）

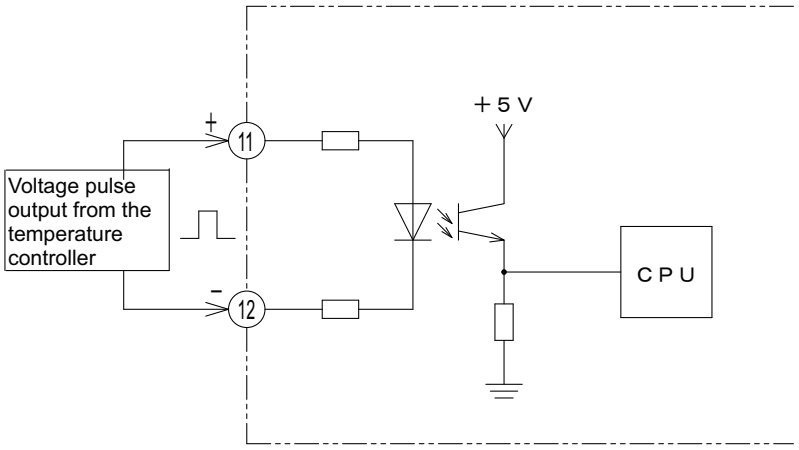
1.3 Input/Output Circuit

■ Current Input Circuits

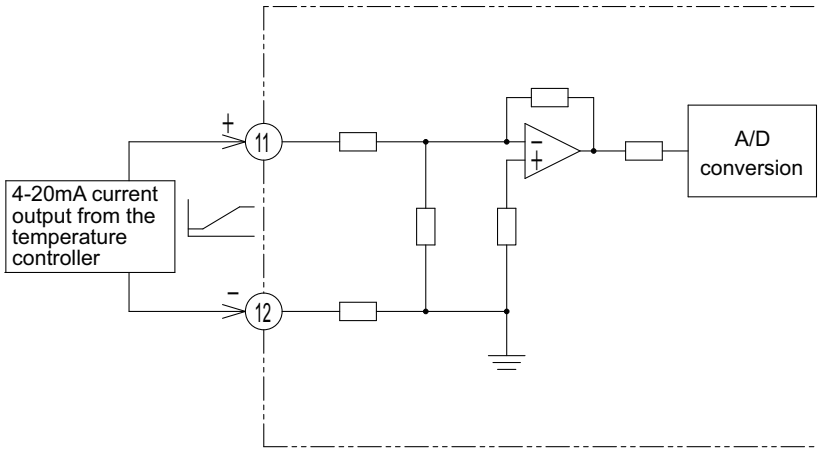
• CT inputs circuit (Heater current)



• Voltage pulse gate input circuit (The voltage control output (ON/OFF) from K8AC-H2_C_ temperature controller is input.)

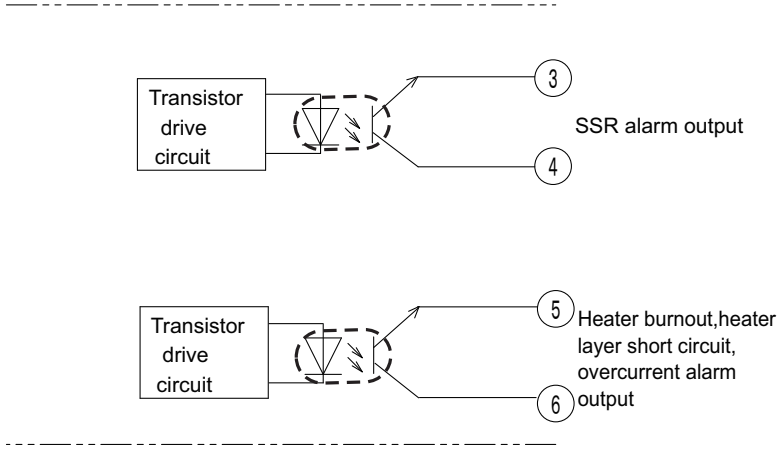


・4-20mA current gate input circuit (The current control output (4-20mA DC) from K8AC-H2_P_ temperature controller is input)

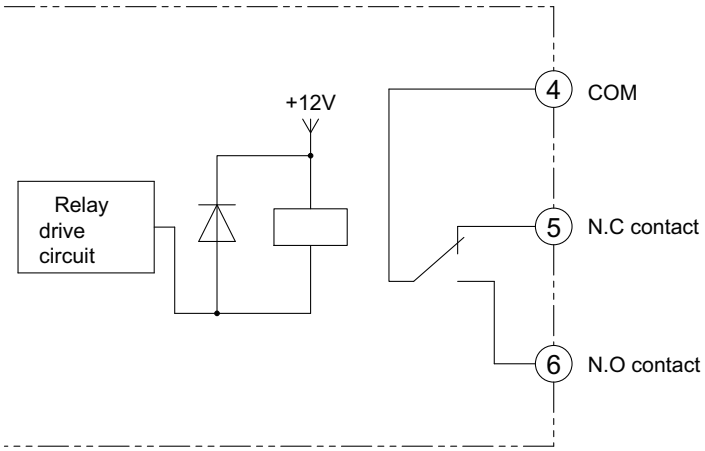


■ Output Circuit

・ Transistor output

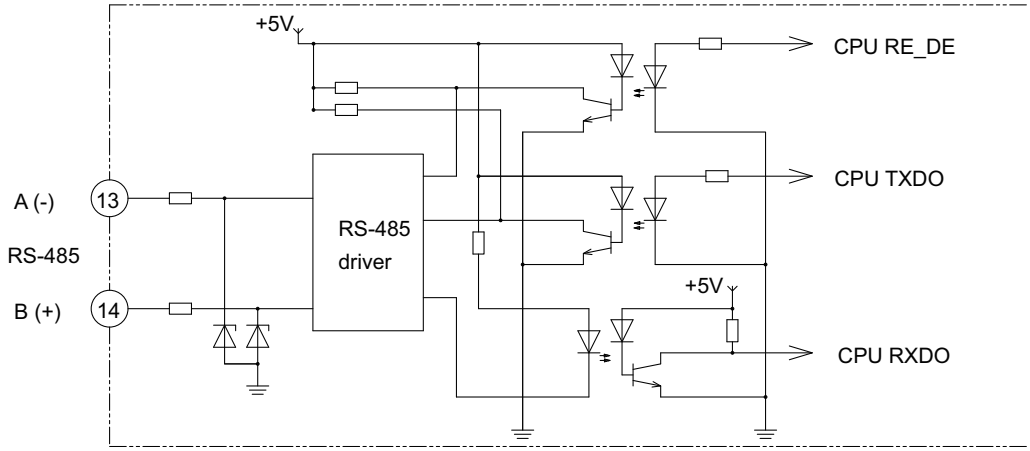


・ Contact outputs

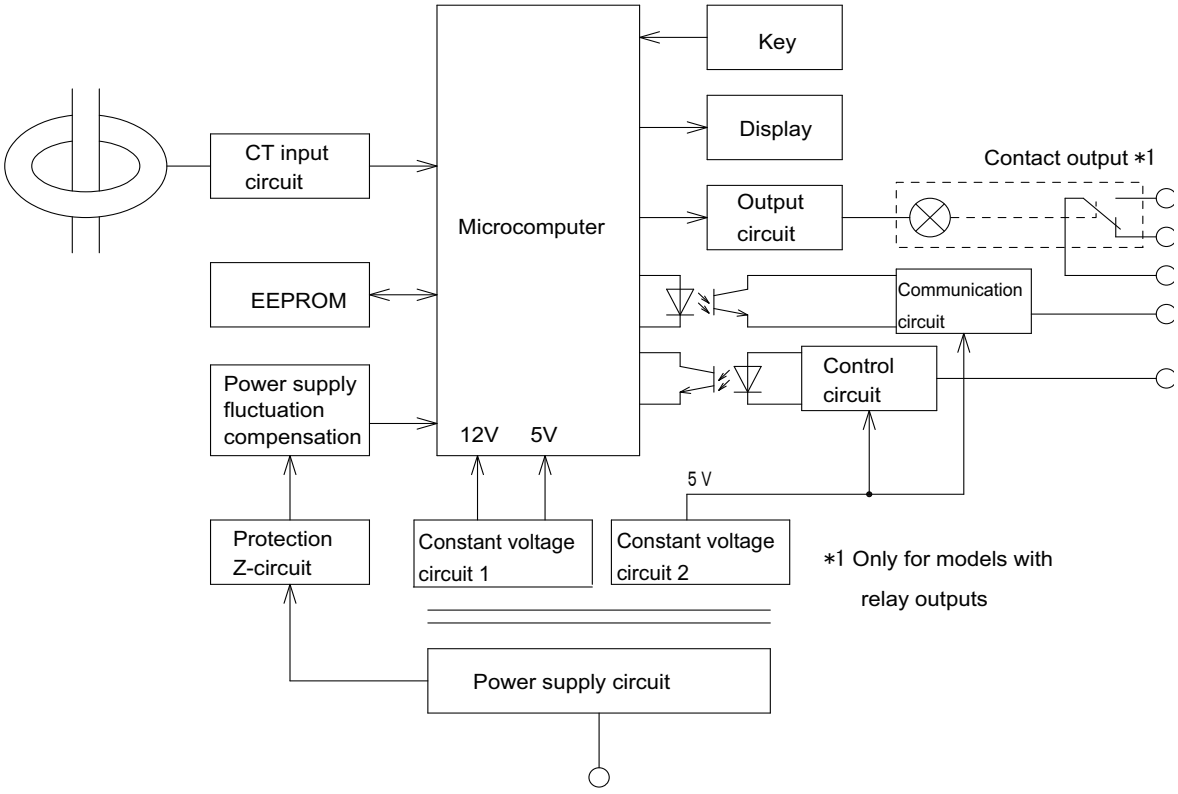


Note: For contact outputs, the same outputs are used for SSR error and for heater burnouts and heater layer short circuit alarm outputs.

・ Communications

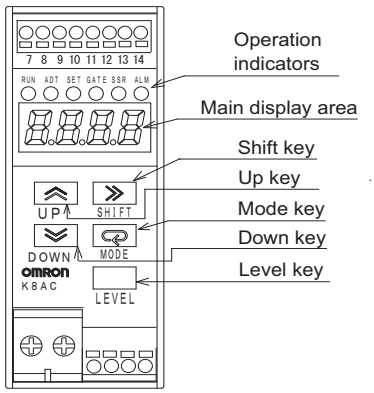


■ Internal Block Diagram



1.4 Nomenclature and Operations

K8AC-H2_ _ _-FLK



Name		Operation
Main display		Displays processing values, parameter characters, and set values.
Operation indicators	RUN (Measurement operation)	Lights when the power is turned ON and the measurement operation is in progress. OFF at all other times.
	ADJ (Adjust)	Lights while in Adjust Mode. Flashes while in Test Mode. OFF at all other times.
	SET (Set)	Lights while in SET Mode. OFF at all other times.
	GATE (Gate)	Lights or turns OFF according to gate input status. Gate pulse : Lights for high voltage pulse; OFF for low voltage pulse. Gate signal (4 to 20 mA) : Lights for 4 mA or over; OFF for less than 4 mA.
	SSR (SSR error) *	Lights when an SSR error occurs (open or short circuit). OFF when SSR is normal.
	ALM (Alarm) *	Lights for heater burnout or overcurrent. OFF at all other times.
UP key		Increments a set value when the set value is in change status.
DOWN key		Decrements a set value when the set value is in change status.

Name	Operation
SHIFT key	Used to check set values while parameters are displayed, and to put set values in change status. Used to shift the set value digit when the set value is in change status.
MODE key	Used to switch displyed parameter.
LEVEL key	Used to change the level.

* Check the specific status using the alarm display parameters on the main display.

Section 2 Preparation

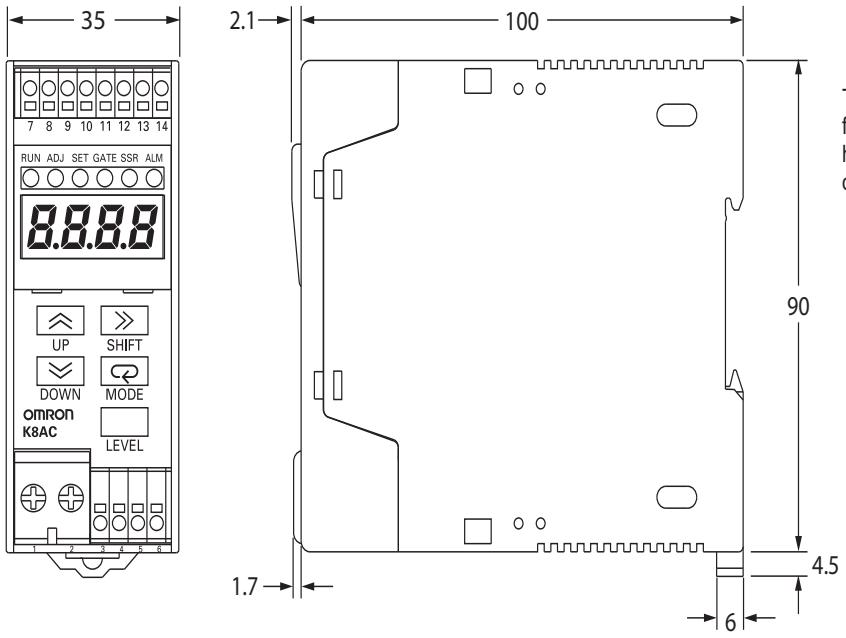
This Chapter describes tasks performed prior to turning the power on such as mounting or wiring.

2.1 Mounting 2-2
External Dimension/Mounting Method/Fixing Bracket/Mounting Direction
2.2 Terminal Arrangement 2-4
Terminal Arrangement/Wiring

2.1 Mounting

■ External Dimension

K8AC-H2_ _ _-FLK

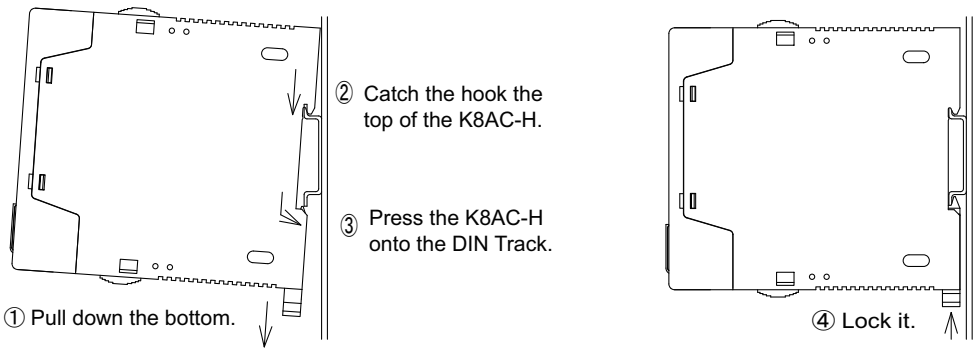


To remova a wire, insert the recomended flat-blade screwdriver straight into the hole under the screw-less clamp terminal of the wire, and simply release the wire.

■ Mounting Method

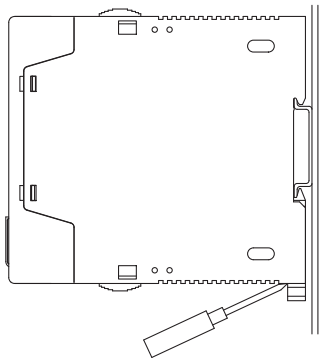
・ Mounting the K8AC-H

Pull down the hook the bottom of the K8AC-H, and then catch the hook on the tpo of the K8AC-H onto the DIN Track and press the K8AC-H onto the DIN Track until it locks into place.



・ Removing

Pull down on the hook with a flat-blade screwdriver and lift up on the K8AC-H



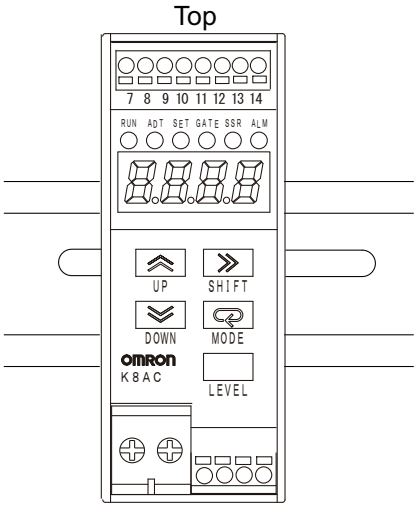
■ Fixing bracket

Use a DIN rail for mounting the K8AC.

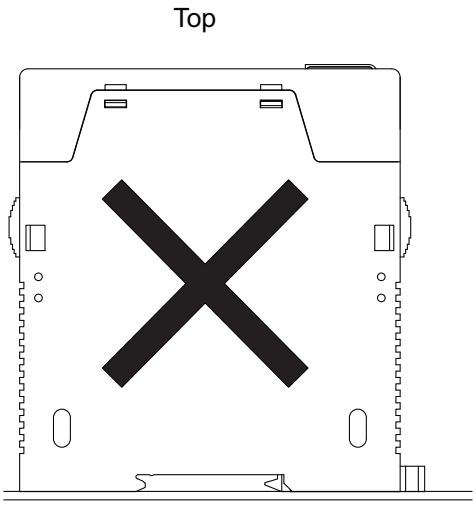
DIN rail: PFP-100N (1,000mm)

PFP-50N (500m)

■ Mounting direction



Vertical mounting (standard)

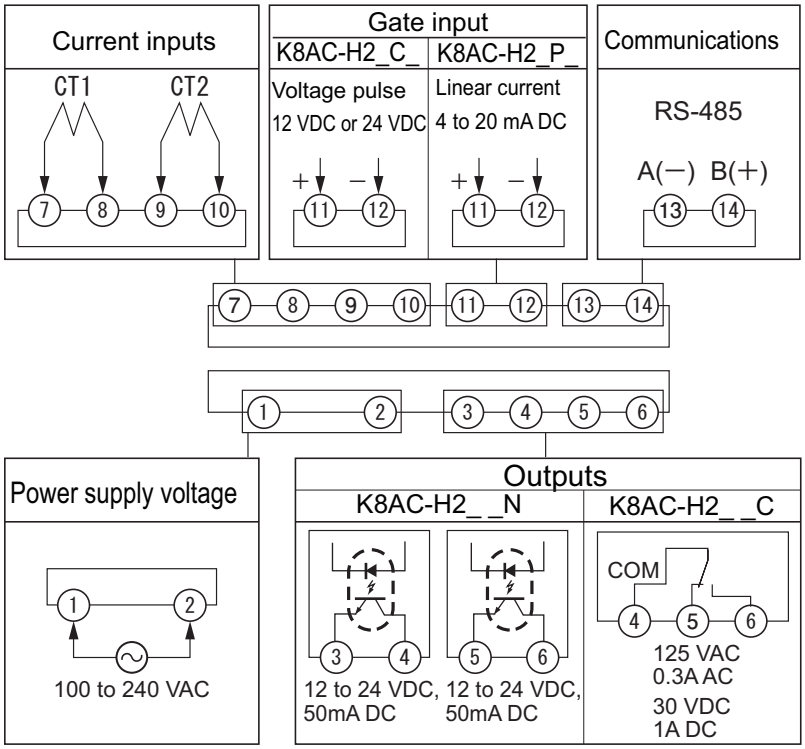


Horizontal mounting

Wrong mounting may deteriorate heat dissipation, resulting in damaged or broken internal elements. Do not use the K8AC-H if not mounted using the standard mounting procedure.

2.2 Terminal Arrangement

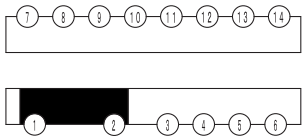
K8AC-H2_ _ _-FLK



Terminal	Name	Description	Applicable model
1 to 2	Power supply voltage	Connect to the operating power supply.	All models
3 to 4, 5 to 6	Outputs	Outputs SSR open or short circuit detection results. Outputs heater burnout or layer short circuit detection results.	K8AC-H2_ _N (transistor output)
5/6 to 4		Outputs an OR of the status of all alarms.	K8AC-H2_ _ _C
7 to 8	Current inputs	Connect to CT1. Current input from CT1 secondary-side output.	All models
9 to 10		Connect to CT2. Current input from CT2 secondary-side output.	
11 to 12	Gate input	Connect to gate signal (voltage pulse).	K8AC-H2_ _C_
		Connect to a 4 to 20-mA gate signal.	K8AC-H2_ _P_
13 to14	Communications	Connect to host device for RS-485 communications.	All models

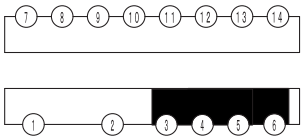
■ Wirng

・ Power supply

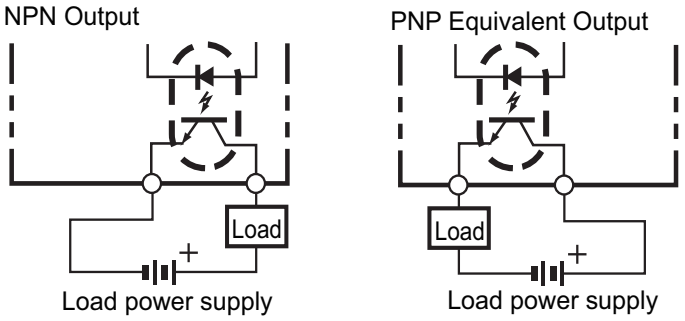


Supply power to terminal number (1) and (2). The power supply specifications are outlined below.
100 to 240 VAC, 50 / 60Hz, 35 VA max.
Turning the power on requires the rated power supply capacity or more. Please take extra care when using multiple units.

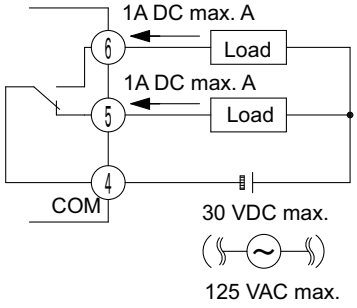
・ Output



Alarm outputs are output from the terminal number (3) to (6).
The output configuration is shown below.
K8AC-H2_ _N: 2 outputs, open collector 24VDC 50mA
The transistor output of the K8AC-H2_ _ N uses a photocoupler for isolation with the internal circuits, and so either an NPN opencollector output or a PNP equivalent output can be used.

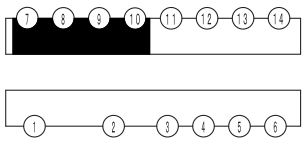


K8AC-H2_ _C: 1c output 125 VAC 0. 3A / 30 VDC 1A.
Use the load that is within the range of the specification. The electrical life expectancy the relay is 100,000 orerations.

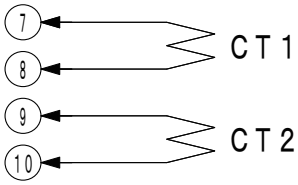


K8AC-H2_ _C

・ Current input



Connect to a special CT (current sensor) for current detection.

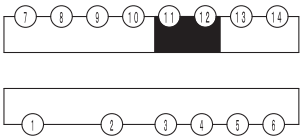


∗ The special CT has no polarity

The special CT should be as follows.
Select an appropriate CT suitable for the current range of your model.

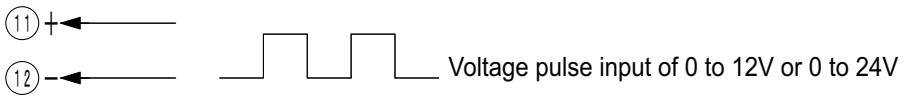
Model (Rated current)	Through-hole diameter	Installation method
K8AC-CT20S (0.200 to 22.00A)	5.8-mm dia.	Surface-mounted with screws
K8AC-CT20L (0.200 to 22.00A)	12-mm dia.	Rear-surface mounted with screws Binding band
K8AC-CT200 (20.0 to 200.OA)	12-mm dia.	Rear-surface mounted with screws Binding band
K8AC-CT200L (20.0 to 200.OA)	30-mm dia.	Surface-mounted with screws

・ Gate input

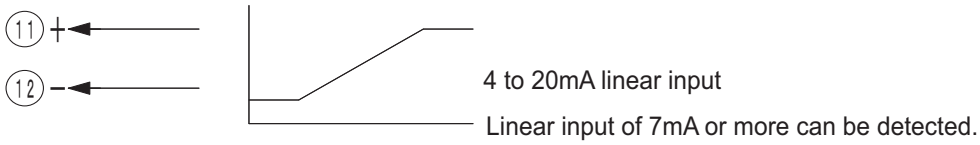


The gate signal suitable for the control method of the heater current must be input.
Input an appropriate gate signal that is suitable for the control type of your model.

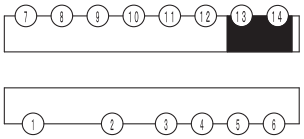
・ ON/OFF control type: K8AC-H2_C_-FLK



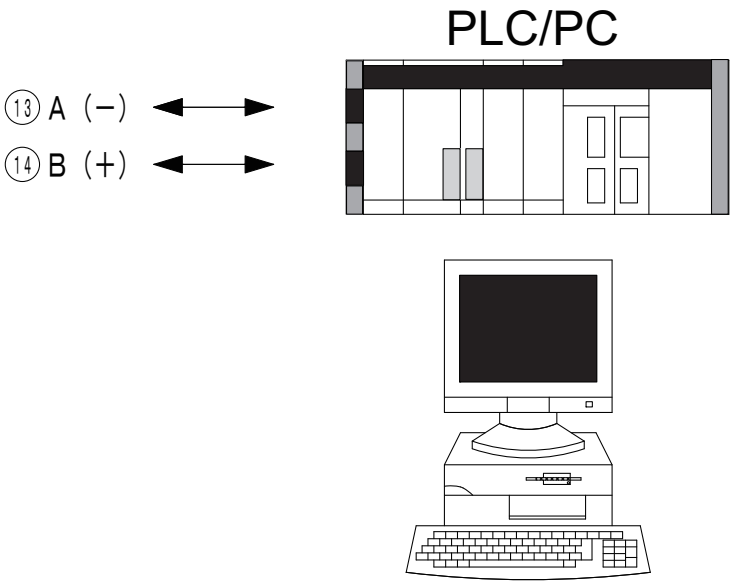
・ Phase / cyclic control type: K8AC-H2_P-FLK



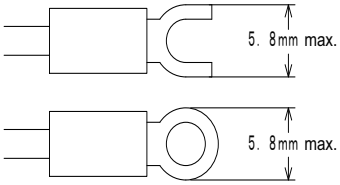
・ Communications



Connect to the host device for RS-485 communications.



■ Recommended Crimp Terminals

Terminals	Recommended crimp terminals	Recom-mended wire gauge
1 and 2	M3 crimp terminals (Width: 5.8 mm max.) 	AWG16 to AWG18
4 to 14	M2 bar terminals: AI 0.34-8TQ (Phoenix Contact)	AWG22
	M2 bar terminals: AI 0.5-8WH (Phoenix Contact)	AWG20
	M2 bar terminals: AI 0.75-8GY (Phoenix Contact)	AWG18

Note：Securely tighten the terminal screws to the following torque.
Power supply terminals: 0.5 N ・ m
I/O terminals: 0.23N ・ m

■ Recommended tools

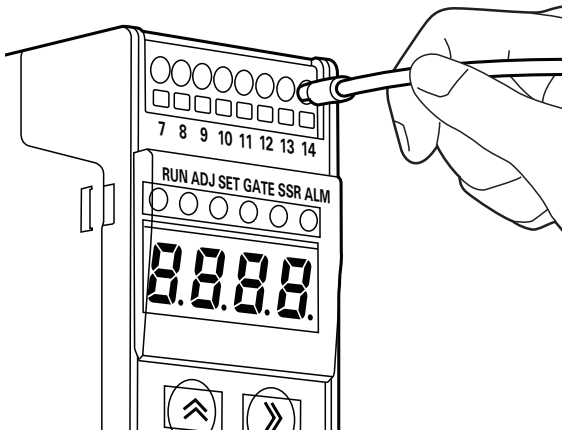
・ Recommended Flat-blade Screwdriver
Manufacturer: Phoenix Contact
Model number: SZF0.4 × 2.5
・ Crimper for Bar Terminals (Crimping tool)
Manufacturer: Phoenix Contact
Model number: CRIMPF0X UD6
Recommended power line diameters: AWG10 to AWG 24

Wiring

・ Do not touch terminals or perform wiring while power is supplied to the product. Doing so may result in injury or malfunction.
・ Wire to the correct terminal number. Incorrect wiring may result in damage to or burning of components.

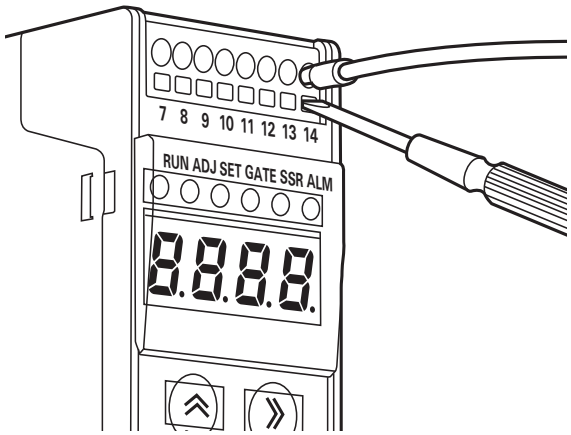
Wiring the screw-less clamp terminal

・ Directly insert the ferrule in the hole of the terminal to be wired.



Removing wires from the screw-less clamp terminal

・ Insert the recommended flat-blade screwdriver straight into the hole to pull out the wire.



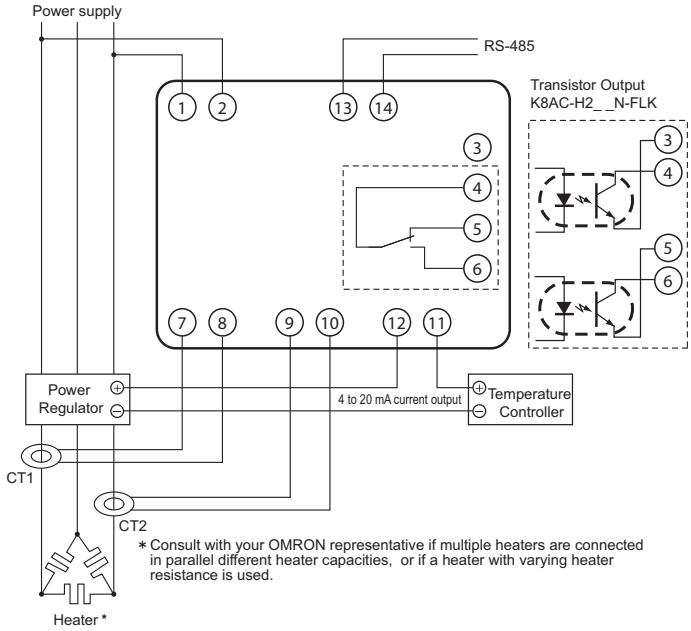
Section 3 Usage Example

This Chapter introduces the usage examples of the K8AC-H.

3.1 External Connection Example.....3-2
3.2 Heater Connection Methods and Current 3-7
3.3 Rate of Change for Currents with Parallel Heaters.....3-8

3.1 External Connection Example

■ Wiring Method When Using the K8AC-H with Phase Control Heaters



Operation Description

・ If the heater current detected at either CT1 or CT2 falls below the burnout alarm set value, an alarm is output.The burnout alarm set value can be set separately for CT1 and CT2.

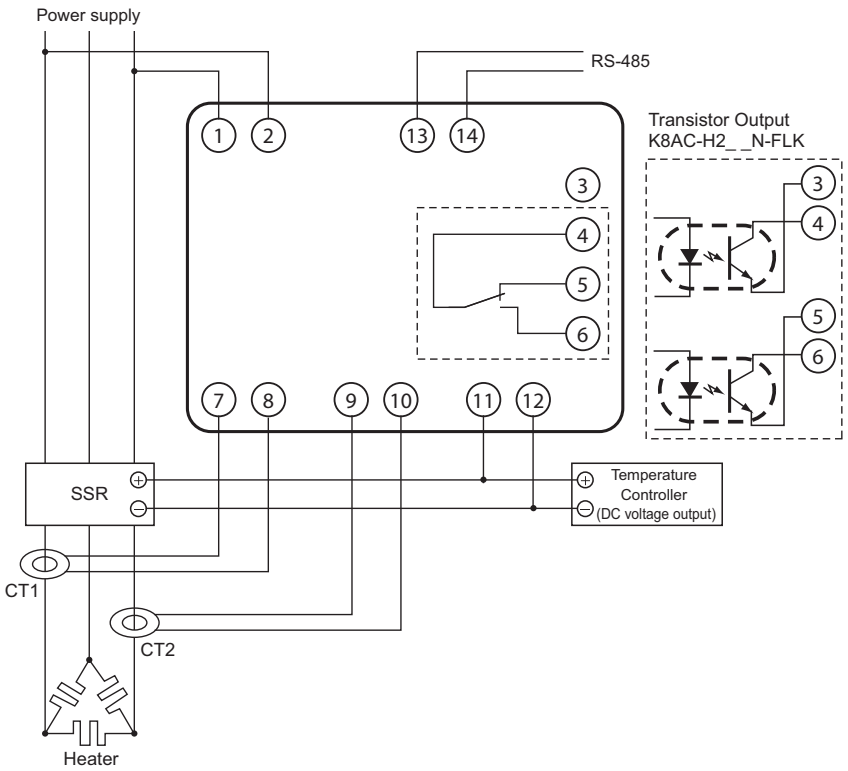
No burnout alarm is output, however, when the temperature controller control output is OFF. Burnouts are detected only while the temperature controller control output is being input to the gate input terminals (11 and 12). Burnout is detected with no errors because the automatic adjustment of burnout alarm level is linked to the temperature controller control output (4 to 20mA).

・ Burnout is detected when control outputs from the temperature controller are 7 mA min.

Correct Usage

・ Always take the power supply voltage from the primary side of the contactor.
・ Use a temperature controller with a 4 to 20mA current output.
・ The K8AC-H adjusts power regulator outputs controlled by 4 to 20mA input, based on the standard value recorded when the regulator is at 100% output.
・ Make sure that the power regulator is at 100% output when adjusting the set burnout alarm value.
・ Adjust the burnout alarm set value at a 100% output for gradient setting as well. When using the power regulator's gradient settings, change the operation gate curret level so that the heater current value is within the measurement range. (The initial value is 7 mA.)
・ If using the soft startup funcution with a power regulator, set the soft startup function on the K8AC-H as well, to prevent malfunctions.
・ CT1 and CT2 are special products. Use K8AC-CT-_ _.
・ The CTs do not have polarity.
・ Connect only one CT for a single-phase heaters.
Connect two CTs for three-phase heaters.
・ For three-phase heaters, always set the burnout alarm set values for both CT1 and CT2.

■ Wiring Method When Using the K8AC-H with SSR Control Heaters



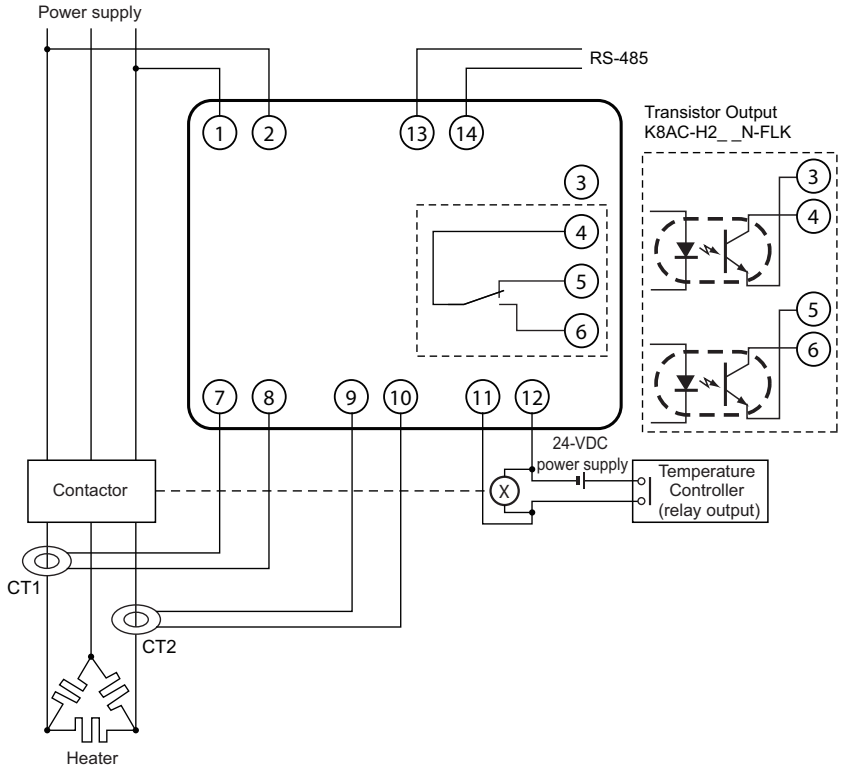
Operation Description

- If the heater current detected at either CT1 or CT2 falls below the burnout alarm set value, an alarm is output. The burnout alarm set value can be set separately for CT1 and CT2.
  No burnout alarm is output, however, when the temperature controller control output is OFF.
  Burnouts are detected only while the temperature controller control output is being input to the gate input terminals (11 and 12). Faulty outputs do not occur because heater burnout detection is linked with the temperature controller.
- The minimum burnout detection time is 200 ms. Shorter burnouts are not detected.
- Turn ON the voltage fluctuation compensation function (default: OFF) to detect power supply voltage fluctuations and automatically compensate the burnout alarm value. Also, turn ON the voltage fluctuation compensation function to detect minor current fluctuations.

Correct Usage

- Always take the power supply voltage from the primary side of the SSR.
- Use temperature controllers with a 12 or 24 - VDC voltage output (30 VDC max.).
- CT1 and CT2 are special products. Use the K8AC-CT_ _.
- The CTs do not have polarity.
- Connect only one CT for single-phase heaters.
- Connect two CTs for three-phase heaters.
- For three-phase heaters, always set the burnout alarm set values for both CT1 and CT2.

■ Wiring Method When Using the K8AC-H with ON / OFF Contactor Control Heaters



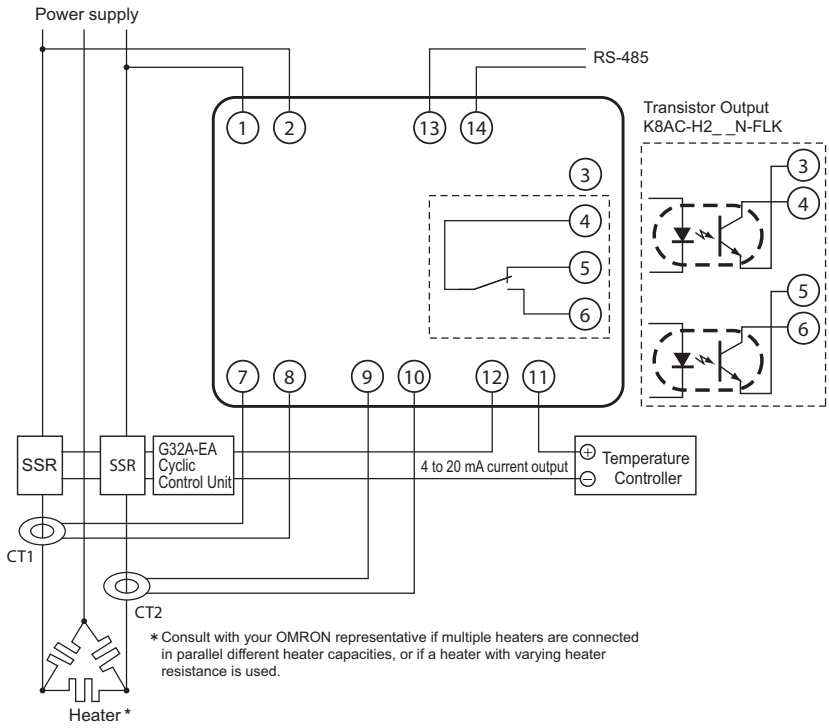
Operation Description

- If the heater current detected at either CT1 or CT2 falls below the burnout alarm set value, an alarm is output. The burnout alarm set value can be set separately for CT1 and CT2.
  No burnout alarm is output, however, when the temperature controller control output is OFF.
  Burnouts are detected only while the temperature controller control output is being input to the gate input terminals (11 and 12). Faulty outputs do not occur because heater burnout detection is linked with the temperature controller.
- The minimum burnout detection time is 200 ms. Shorter burnouts are not detected.
- Turn ON the voltage fluctuation compensation function (default: OFF) to detect power supply voltage fluctuations and automatically compensate the burnout alarm value. Also, turn ON the voltage fluctuation compensation function to detect minor current fluctuations.

Correct Usage

- Always take the power supply voltage from the primary side of the SSR.
- Use a temperature controller with relay output. The input to the gate input terminals (11 and 12) must be a DC voltage input, so wire the 24 VDC power supply as shown in the diagram to the left.
- The CT1 and CT2 are dedicated to the use with the K8AC-CT_ _ _. Do not use them with other detectors.
- The CTs do not have polarity.
- Connect only one CT for single-phase heaters.
  Connect two CTs for three-phase heaters.
- For three-phase heaters, always set the burnout alarm set values for both CT1 and CT2.

■ Wiring Method When Using the K8AC-H with Cyclic Control Heaters



Operation Description

- If the heater current detected at either CT1 or CT2 falls below the burnout alarm set value, an alarm is output. The burnout alarm set value can be set separately for CT1 and CT2.

No burnout alarm is output, however, when the temperature controller control output is OFF. Burnouts are detected only while the temperature controller control output is being input to the gate input terminals (11 and 12). Burnout is detected with no errors because the automatic adjustment of burnout alarm level is linked to the temperature controller control output (4 to 20mA).

- Burnout is detected when control outputs from the temperature controller are 7 mA min.

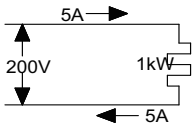
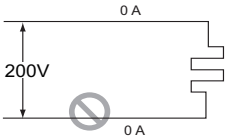
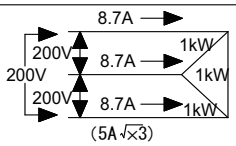
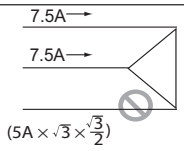
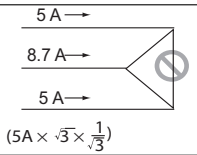
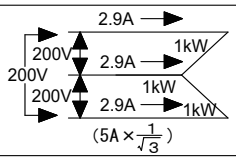
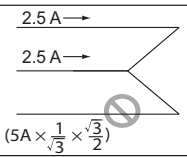
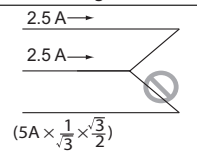
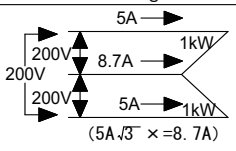
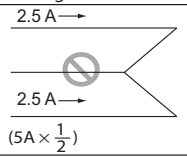
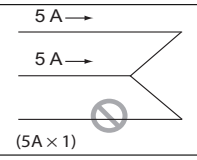
Correct Usage

- Always take the power supply voltage from the primary side of the SSR.
- Use a temperature controller with a 4 to 20mA current output.
- The K8AC-H adjusts power regulator outputs controlled by 4 to 20mA input, based on the standard value recorded when the regulator is at 100% output.
- Make sure that the power regulator is at 100% output when adjusting the set burnout alarm value.
- Adjust the burnout alarm set value at a 100% output for gradient setting as well. When using the power regulator's gradient settings, change the operation gate curret level so that the heater current value is within the measurement range. (The initial value is 7 mA.)
- Set the cycle time to a value matching to that of the power regulator. Restart the unit after setting the value. (Initial value: 0.2 s)
- CT1 and CT2 are special products. Use the K8AC-CT_ _.
- The CTs do not have polarity.

- Connect only one CT for single-phase heaters.
  Connect two CTs for three-phase heaters.
- For three-phase heaters, always set the burnout alarm set values for both CT1 and CT2.

3.2 Heater Connection Methods and Current

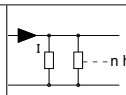
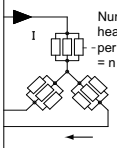
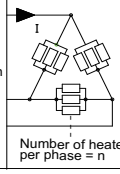
Depending on the heater connection method, the current when an error occuors will be as shown in the following table. Refer to this table when determining burnout alarm set values.

		Normal condition	Abnomal condition	
Single-phase				
Three-phase	Delta connection			
	Star connection			
	V connection			

Note: This is the current for when a 200V, 1-kW heater is used for single-phase or three-phase operation.

3.3 Rate of Change for Currents with Parallel Heaters

The following table shows the current change ratios when multiple heaters of the same capacity are connected in parallel and one of the heater elements burns out. Use this table for reference when making corrections.
If five single-phase heaters are connected in parallel, the current change when burnout occures is 20% per heater.
For example, if the current for a single heater is low and the change ratio is very slight, it may not be detected. Therefore take into account the detection accuracy for the total current when selecting the number of heaters to be connected in parallel.

Connection			n=1	n=2	n=3	n=4	n=5
Single-phase			With one heater burned out,I is 0	0.5	0.67	0.75	0.8
Star connection		Current in burned-out phase	With one heater burned out,I is 0	0.6	0.75	0.82	0.86
		Current in other phases	0.87	0.92	0.95	0.96	0.97
Delta connection		Current in lines near burned-out phase (Same as 2-phase.)	0.58	0.77	0.84	0.88	0.91
		Current in other phases	1	1	1	1	1

Note 1: The figures in the above table show the current change ratios when burnout occurs for one heater connected in parallel.

2: The numbers represent the current ratio after one heater burns out, with the current prior to the burnout (i.e., the normal current) taken as 1.

3: In actual operation there may be effects from factors such as load (heater) imbalances, so conduct an actual test for confirmation before making adjustments if the current change ratio between normal and abnomal operation is slight.

4: Consult with your OMRON representative if multiple heaters are used with different heater capacities.

Section 4 Initial Setup

This Section describes the flow of the initial settings for the K8AC-H.

4.1 ON/OFF Control 4-2
4.2 Phase Control 4-4
4.3 Cyclic Control 4-6

4.1 ON/OFF Control

The initial setting flow for the K8AC-H22CC-FLK (2 to 22A input, ON/OFF control, relay output type) is described below based on the following setting conditions.

<Setting Conditions>
The assumption of this method is that ten 300-W rated heaters are connected in parallel to a single-phase 200-V power supply.
- The burnout alarm value 1 is set in such a way that a heater burnout alarm can be output when the current measured at CT1 is 14.25A or less.
- The burnout alarm value 2 is set in such a way that any heater burnout alarm will not be output by the current measured at CT2.

* Burnout alarm value = (Normal current + current at malfunction) / 2

Initial setting flow

A. Check the wiring and turn the power on.

The gate input function is turned on (enabled) at the initial factory setting, so a burnout alarm is not output unless an input is applied to the pulse voltage input terminal.
Connect a temperature controller with appropriate voltage pulse output specifications and apply a gate input.

B. Set “Burnout Alarm 1” to “14.25 A”

1. When the heater 1 current monitor value is displayed（RUN Mode）, press the □（Level）Key for at least 3 seconds to change to ADJ Mode.
2. Set the parameter “AL-1” to “14.25”.

C. Set the least significant digit of the “Burnout Alarm 2” to “*.**-”.

1. Set the least significant digit of the parameter “AL-2” to “-” to disable the burnout alarm 2.
2. Setting the least significant digit to “-” and confirming it will automatically result in zero suppression “-” .

D. Change to the actual operation.

1. Change to RUN Mode by pressing the □(Level) Key for at least 1 second or waiting for 300 seconds (5 minutes) without pressing any key while the parameter is displayed in ADJ Mode.

All clear function of set values

If you encounter a problem with your initial setting from which you cannot recover, you can start over from the beginning by only resetting to the initial values. For how to reset to the initial values, please refer to “5-14 Initialization of Set Values”. The initial values are values at the initial factory setting.

∗ For the parameter list or details on how to set parameters, please see “Section 5 Operation”.

Note:

The setting for “alarm hysteresis”, “setting of gate input function”, “voltage fluctuation compensation”, “startup lock timer” and “output ON-delay time” can be changed as required.

When the heater ON time is 200ms or less, set the ”soft startup time” to avoid detecting an input signal of 200ms or less.

These parameters are set in SET Mode.

4.2 Phase Control

The initial setting flow for the K8AC-H22PC-FLK (2 to 22A input, phase control, relay output type) is described below based on the following setting conditions.

<Setting Conditions>
The assumption of this method is that ten 300-W rated heaters are connected in parallel to a single-phase 200-V power supply.

- The burnout alarm value 1 is set in such a way that a heater burnout alarm can be output when the current measured at CT1 is 14.25A or less.
- The burnout alarm value 2 is set in such a way that any heater burnout alarm will not be output by the current measured at CT2.

∗ Burnout alarm value = (Normal current + current at malfunction) / 2

Initial setting flow

A. Check the wiring and turn the power on.

The gate input function is turned on (enabled) at the initial factory setting, so a burnout alarm is not output unless an input is applied at the gate input terminal. Burnout detection is possible for a gate input current of 7 mA or greater.
Connect a temperature controller with appropriate 4 to 20mA output specifications and apply an input of 4 to 20mA.

B. Set “Measurement Method” to “PH-1”.

1. When the heater 1 current monitor value is displayed (RUN Mode), press the □ (Level) Key for at least 3 seconds to change to ADJ Mode.
2. Change to SET Mode by entering the password. (Set the parameter “Adbu” to “0169”.
3. Set the parameter “mSmd” to “PH-1”.

C. Set “Burnout Alarm 1” to “14.25 A”.

1. When the heater 1 current monitor value is displayed (RUN Mode), press the □ (Level) Key for at least 3 seconds to change to ADJ Mode.
2. Set the parameter “AL-1” to “14.25”.

D. Set the least significant digit of the “Burnout Alarm 2 ” to " *.**-".

1. Set the least significant digit of the parameter “AL-2” to “-”. to disable the burnout alarm 2.
2. Setting the least significant digit to “-” and confirming it will automatically result in zero suppression “-”.

Note:
The K8AC-H is dedicated to monitoring the burnout of heaters controlled by three-arm power regulators.
Correct monitoring is not possible if it is used in a circuit using six-arm power regulators.

E. Change to the actual operation.

1. Change to RUN Mode by pressing the □ (Level) Key for at least 1 second or waiting for 300 seconds (5 minutes) without pressing any key while the parameter is displayed in ADJ Mode.

All clear function of set values

If you encounter a problem with your initial setting from which you cannot recover, you can start over from the beginning by only resetting to the initial values. For how to reset to the initial values, please refer to “5-14 Initialization of Set Values”. The initial values are values at the initial factory setting.

∗ For the parameter list or details on how to set parameters, please see “Section 5 Operation”.

Note:

The setting for “alarm hysteresis”, “setting of gate input function”, “gvoltage fluctuation compensation”, “startup lock timer” and “output ON-delay time” can be changed as required.
These parameters are set in SET Mode.
When using gradient settings with a power controller, change the operation gate current level in such a way that the heater current value falls within the measurement range. (Initial value: 7mA)
This parameter is set in GATE mode.

4.3 Cyclic Control

The initial setting flow for the K8AC-H22PC-FLK (2 to 22A input, phase/cyclic control, relay output type) is described below based on the following setting conditions.

<Setting Conditions>
The assumption of this method is that ten 300-W rated heaters are connected in parallel to a single-phase 200-V power supply.
The power regulator cycle is set to 0.5 s.
The burnout alarm value 1 is set in such a way that a heater burnout alarm can be output when the current measured at CT1 is 14.25A or less.
The burnout alarm value 2 is set in such a way that any heater burnout alarm will not be output by the current measured at CT2.

∗ Burnout alarm value = (Normal current + current malfunction) / 2

Initial setting flow

A. Check the wiring and turn the power on.

The gate input function is turned on (enabled) at the initial factory setting, so a burnout alarm is not output unless an input is applied at the gate input terminal. Burnout detection is possible for a gate input current of 7mA or greater.
Connect a temperature controller with appropriate 4 to 20mA output specifications and apply an input of 4 to 20mA.

B. Set "Measurement Method" to "CYCL".

1. When the heater 1 current monitor value is displayed (RUN Mode), press the □ (Level) Key for at least 3 seconds to change to ADJ Mode.
2. Change to SET Mode by entering the password. (Set the parameter "Adbu" to "0169").
3. Set the parameter "mSmd" to "CYCL".

C. Set the cycle time to "0.5".

1. When the heater 1 current monitor value is displayed (RUN Mode), press the □ (Level) Key for at least 3 seconds to change to ADJ Mode.
2. Change to SET Mode by entering the password. (Set the parameter "Adbu" to "0169").
3. Set the parameter "CYCt" to "0.5".

D. Set "Burnout Alarm 1" to "14.25 A".

1. When the heater 1 current monitor value is displayed (RUN Mode), press the □ (Level) Key for at least 3 seconds to change to ADJ Mode.
2. Set the parameter "AL-1" to "14.25".

E. Set the least significant digit of the "Burnout Alarm 2" to "∗.∗∗−".

1. Set the least significant digit of the parameter "AL-2" to "-" to disable the burnout alarm 2.
2. Setting the least significant digit to "-" and confirming it will automatically result in zero suppression "-".

F. Restart the unit.

All clear function of set values

If you encounter a problem with your initial setting from which you cannot recover, you can start over from the beginning by only resetting to the initial values. For how to reset to the initial values, please refer to “5-14 Initialization of Set Values”. The initial values are values at the initial factory setting.

∗ For details on how to set parameters, please see “Section 5 Operation”.

Note:

The setting for “alarm hysteresis”, “setting of gate input function”, “voltage fluctuation compensation”, “startup lock timer” and “output ON-delay time” can be changed as required.
These parameters are set in SET Mode.
When using gradient settings with a power controller, change the operation gate current level in such a way that the heater current value falls within the measurement range. (Initial value: 7mA)
This parameter is set in GATE mode.

■ Setting Method

<Setting Method for SSR and ON/OFF Control Heaters>

Setting Conditions

Detecting burnouts in just one heater when ten 300-W rated heaters are connected in parallel to a single-phase 200-V power supply. The heater is SSR controlled.

Normal heater Current and Heater Current with One Heater Element Burnout

Normal current = (300 W × 10 (heaters) / 200 V = 15.0 A

Current with one burnout = 15A × 0.9 = 13.5 A

Heater burnout alarm set value =

(Normal current + current at malfunction) /2 = (15.0 + 13.5) /2 = 14.3A

Selecting Heater Element Burnout Detector Models

For the above example, K8AC-H22C_-FLK would be selected.

The burnout alarm set value is 14.3 A, so the current input range 2.00 to 22.00 A should be selected.

SSR control is used, so type C should be selected. (Type C is also selected for ON/OFF control.)

Select the approriate realy or transistor output specifications, depending on the application.

K8AC-H Parameter Setting Procedure

(Only the minimum settings are shown here. Refer to “Section 5 Operation” for information on how to set parameters.)

1. Turn ON the power to the K8AC-H. The initial status when power is turned ON is called RUN Mode.
2. Press the □ Key for at least 3 s to change from RUN Mode to ADJ Mode (the mode for adjusting burnout alarm set values.)

3. Set the burnout alarm set value. (AL-1 = CT1 burnout alarm set value and AL-2 = CT2 burnout alarm set value.)

   Set "14.25" to AL-1.

   Set the AL-2 burnout alarm set value to "----" so that it will not detect heater burnout, because this is a single-phase heater.

4. Change to RUN Mode.

   Press the □ Key while in ADJ Mode for at least 1 s to change to RUN Mode.

5. Check operation.

   Test heater burnout detection by burning out one heater. Also check that there are no malfunctions during temperature control.

   Note: The default setting for functions including the voltage fluctuation compensation func tion, alarm, hysteresis, output ON-delay time, and SSR error detection function is OFF. Turn ON any of these functions as required.

<Settings Method for Cyclic and Phase Control Heaters>

Settings conditions

Detecting burnouts in one heater when five 1,000 W-rated heaters are connected to each phase of a three-phase delta-connected 200-V power supply.

A power regulator (cyclic control or phase control) performs heater control.

Normal Heater Current and Heater Current With One Heater Element Burnout

Normal current = (1000 W × 5 heaters) / (200 V/$\sqrt{3}$) = 43.3 A

Current with one burnout = 43.3 A × 0.91= 39.4 A

Heater burnout alarm set value =

(Normal current + current at malfunction) /2 = (43.3 + 39.4)/2 = 41.4A

Selecting Heater Elment Burnout Detector Models

For the above example, K8AC-H23P_-FLK would be selected.

The burnout alarm set value is 41.4A, so the current input range 20.0 to 200.0A should be selected.

Phase control is used, so type P should be selected. (Type P is also selected for cyclic control.) Select the appropriate relay or transistor output specifications, depending on the apprica tion.

K8AC-H Parameter Setting Procedure

(Only the minimum settings are shown here. Refer to "Section 5 Operation" for information on how to set parameters.)

1. Turn ON the power to the K8AC-H. The initial status when power is turnsd ON is called RUN Mode.
2. Press the □ Key for at least 3 s to change from RUN Mode to ADJ Mode (the mode for adjusting burnout alarm set values.)
3. Change from ADJ Mode to Set Mode (the default settings mode for all functions).The phass word "0169" is required to move to Set Mode.
4. Set the heater control method parameter to "PH-3 (three-phase control)" .

   The default setting is "PH-1 (single-phase control)" .

   Note: Set the parameter to "CYCL (cyclic control)" when using cyclic control.
5. Press the □ Key for at least 1 s to change from Set Mode to ADJ Mode. Press the □ Key again for at least 1 s to change from ADJ Mode to RUN Mode.

   Note: The default setting for functions including the voltage fluctuation compensation func tion, alam hysteresis, output ON-delay time, and SSR error detection function is OFF. Turn ON any of these functions as required.

Burnout Alarm Set Value Setting Method Setting Method

1. Wire the K8AC-H, temperature controller (4 to 20mA current output type), and power regulator.
2. Press the □ Key on the K8AC-H for at least 3 s to change from RUN Mode to ADJ Mode
3. "RL - 1 (CT1 burnout alarm set value)" will be displayed when the mode is changed to ADJ Mode. Press the ≫ key once when RL - 1 is displayed. Next, press the ⩓ Key once. The present heater current value will be displayed on the main display, so note this as the normal current value. Always have the temperature controller output at 20.0mA at this time. (See note 1)

Note: 1. The K8AC-H automatically adjusts burnout alarm levels to compensate based on the power regulator output controlled by the 4 to 20 mA input from a temperature controller. The output must be kept at 20 mA as the burnout alarm set value needs to be set with the temperature controller output at 100% (20 mA output).

4. Next, disconnect one heater and note the heater current in this burnout state. Alterna tively, use the current when one heater is burned out (calculated earlier) as the current during malfunction. It is recommended that the current at an actual burnout is confirmed.
5. Set the K8AC-H burnout alarm set value based on the results. The burnout alarm set value is set at the mid-point between the normal current and the current at malfunction, taking errors and variations in heater capacitiy into considerration.
6. In this setting example, the set value for "RL -2" (CT2 burnout alarm setting) is the same as the set value for "RL - 1". (See note 2)

Note: 2. If the heater capacity is unbalanced, the burnout alarm values for CT1 and CT2 may not be the same.

3. When using gradient settings with a power controller, change the operation gate current level in such a way that the heater current value falls within the measurement range. This parameter is set in GATE mode.

Section 5 Operation

This Section describes operations from the front panel such as how to move between modes or change parameters.

5.1 Modes 5-3
5.2 Moving between Modes 5-4
5.3 Parameters 5-6
5.4 Setting the Parameter 5-11
5.5 Measurement Display 5-12
5.6 Compensation of Processing Value Display 5-18
5.7 Reset of Measurement Monitor Values 5-20
5.8 Alarm Indicators 5-22
5.9 Test Function 5-23
5.10 Setting Protection Function 5-25
5.11 Selecting Burnout Alarm Set Values 5-27
5.12 Selecting Voltage Fluctuation Compensation Standard Value 5-30
5.13 All Initialization 5-32
5.14 Set Value Initialization 5-34
5.15 Processing Value Initialization 5-36
5.16 Setting of Alarm Hysteresis 5-38
5.17 Setting of Gate Input Function 5-40
5.18 Setting of Voltage Fluctuation Compensation Function 5-42
5.19 Setting of Startup Lock Time 5-44
5.20 Setting of Output ON Delay Time 5-46
5.21 Setting of Soft Startup Time 5-48
5.22 Setting of SSR Short Circuit Detection Function 5-50
5.23 Setting of SSR Open Circuit Detection Function 5-52
5.24 Setting of Heater Layer Short Circuit Detection Function 5-54
5.25 Setting of Heater Layer Short Circuit Alarm Level 5-56

5.26 Selection of Heater Control Method (Only for phase and cyclic control type K8AC-H2_ _P_).....5-58
5.27 Setting of Switch Display 5-60
5.28 Setting of Power Save Mode 5-62
5.29 Setting of Power Save Mode Standby Time.....5-64
5.30 Setting of Display Mode 5-66
5.31 Setting of Display Refresh Time.....5-69
5.32 Setting of Unit Number.....5-71
5.33 Setting of Baud Rate.....5-73
5.34 Setting of Data Length 5-75
5.35 Setting of Stop Bits.....5-77
5.36 Setting of Parity Bit 5-79
5.37 Setting of Gate OFF Alarm Output Hold Time (Only for ON/OFF control type heaters ; K8AC-H2_ _C_) 5-81
5.38 Setting of Operation Gate Current Level (Only for phase or cyclic control type heaters: K8AC-H2_ _P_) 5-83
5.39 Setting of Number of CT Passes 5-85
5.40 Setting of CT Ratio.....5-87
5.41 Setting of Number of Effective Digits to be Displayed after the Decimal Point.....5-89
5.42 Setting SSR ON Delay.....5-91
5.43 Setting SSR Operation Gate Current Level (Only for phase or cyclic control type heaters: K8AC-H2_ _P_) 5-93
5.44 Setting Cycle Time (Only for cyclic control type heaters: K8AC-H2_ _P_) 5-95

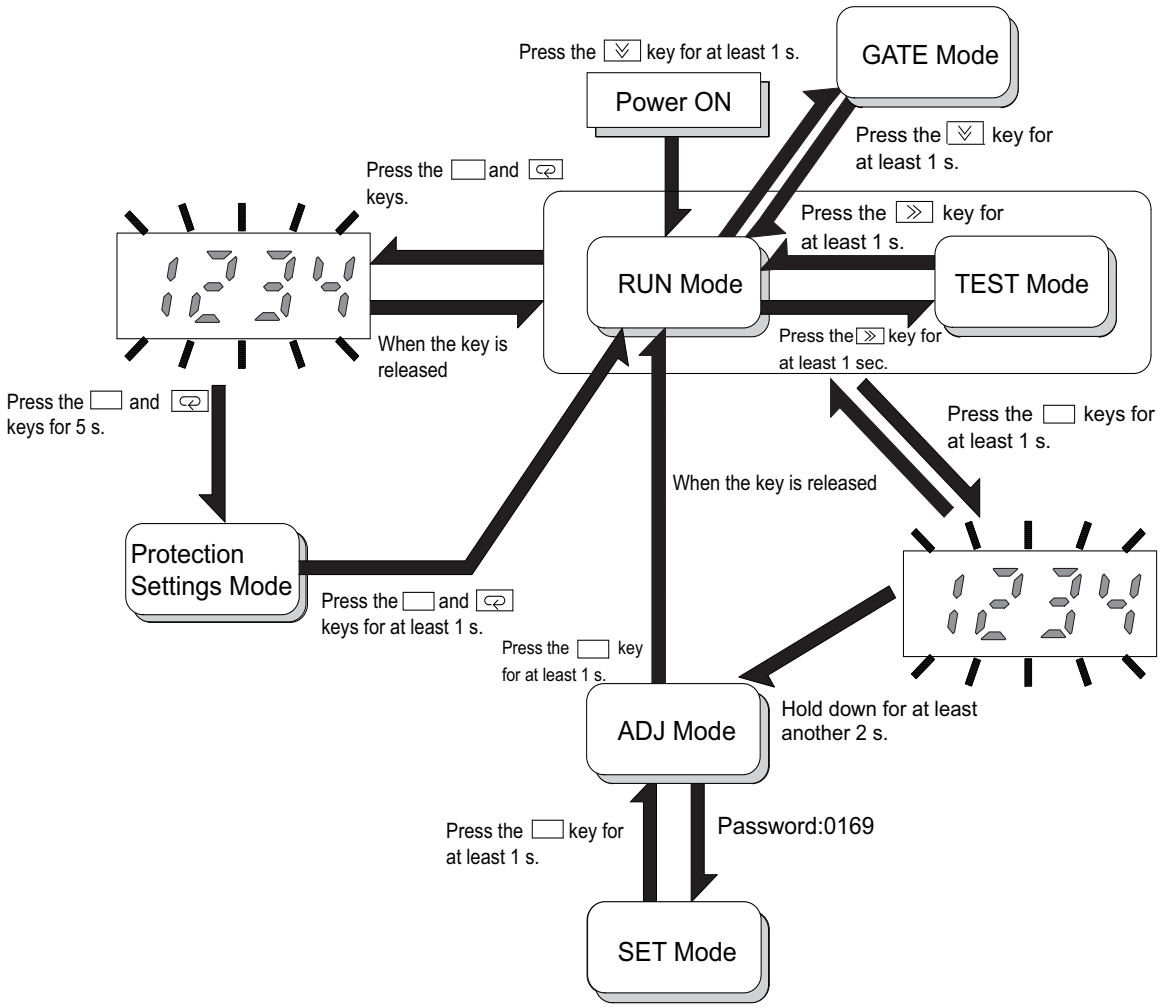
5.1 Modes

Groups of setting items are called "**modes.**" The K8AC-H has five modes.

Mode	Function	Alarm operation
RUN Mode	This is the normal operating mode, used for receiving inputs, executing heater burnout outputs, etc. Operation goes into RUN Mode immediately after power is turned ON.	Executed
ADJ Mode	This mode is used to change comparatively frequently set parameters, such as alarm value settings. This also the mode for entering the password to move to SET Mode.	Stopped
SET Mode	This mode is used to make the initial settings for the various functions.	Stopped
Protection Settings Mode	This mode is used to make settings to prevent unintended key operations. The protected modes are not displayed, preventing changes to set values.	Stopped
TEST Mode	This mode is used to simulate inputs with key operations to test alarm outputs.	Executed
GATE Mode	This mode sets the gate current value that stops an alarm or detection.	Executed

Note: If more than five minutes elapse with no operations performed in the Protection Settings Mode, ADJ Mode, or SET Mode, the status will automatically return to the processing value display. If this occurs while settings are in progress, it may cause unintended operations in RUN Mode (processing value display). Be careful not to allow this to happen.

5.2 Moving between Modes


Press the key for at least 1 s.
GATE Mode
Power ON
Press the key for at least 1 s.
Press the and keys.
Press the key for at least 1 s.
RUN Mode
TEST Mode
When the key is released
Press the key for at least 1 sec.
Press the and keys for 5 s.
Press the keys for at least 1 s.
When the key is released
Protection Settings Mode
Press the and keys for at least 1 s.
Press the key for at least 1 s.
ADJ Mode
Hold down for at least another 2 s.
Press the key for at least 1 s.
Password:0169
SET Mode

To ADJ Mode

When the key is pressed for one second in RUN Mode, the 7-segment display will begin to flash. If the key is held down for another two seconds, the mode will be switched to ADJ Mode. To return to RUN Mode from ADJ Mode, press the key for at least one second.

To Protection Setting Mode

When the and keys are pressed for one second in RUN Mode, the 7-segment display will begin to flash. If the keys are held down for another five seconds, the mode will be switched to Protection Settings Mode. To return to RUN Mode from Protection Setting Mode, press the and keys for at least one second.

To Test Mode

When the key is pressed for at least one second in RUN Mode, the mode will be switched to TEST Mode. To return to RUN Mode from TEST Mode, press the key for at least one second.

To Gate Mode

When the ⊻ key is pressed for at least one second in RUN Mode, the mode will be switched to GATE Mode. To return to RUN Mode from GATE Mode, press the ⊻ key for at least one second. This will be displayed with the K8AC-H2_P_-FLK.

To SET Mode (Password input)

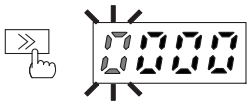
A special operation is required to move to SET Mode.
Use the following procedure.

Operation procedure

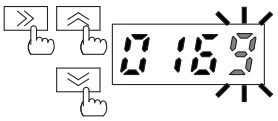
A. Move to the ADJ Mode and use the ⊏ key to display the parameter for moving to the SET Mode.

- The parameter characters are "Adj".

B. Press the ≫ key to display the set value (password).

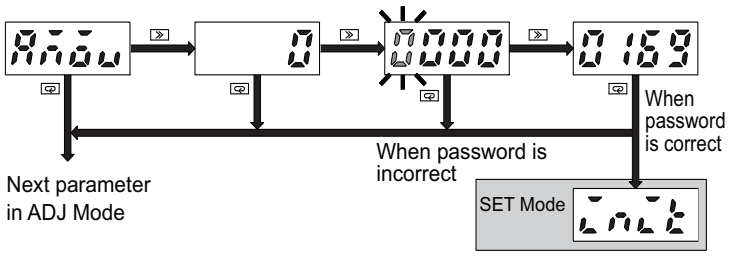


C. Press the ≫ key again to enable changing the password.



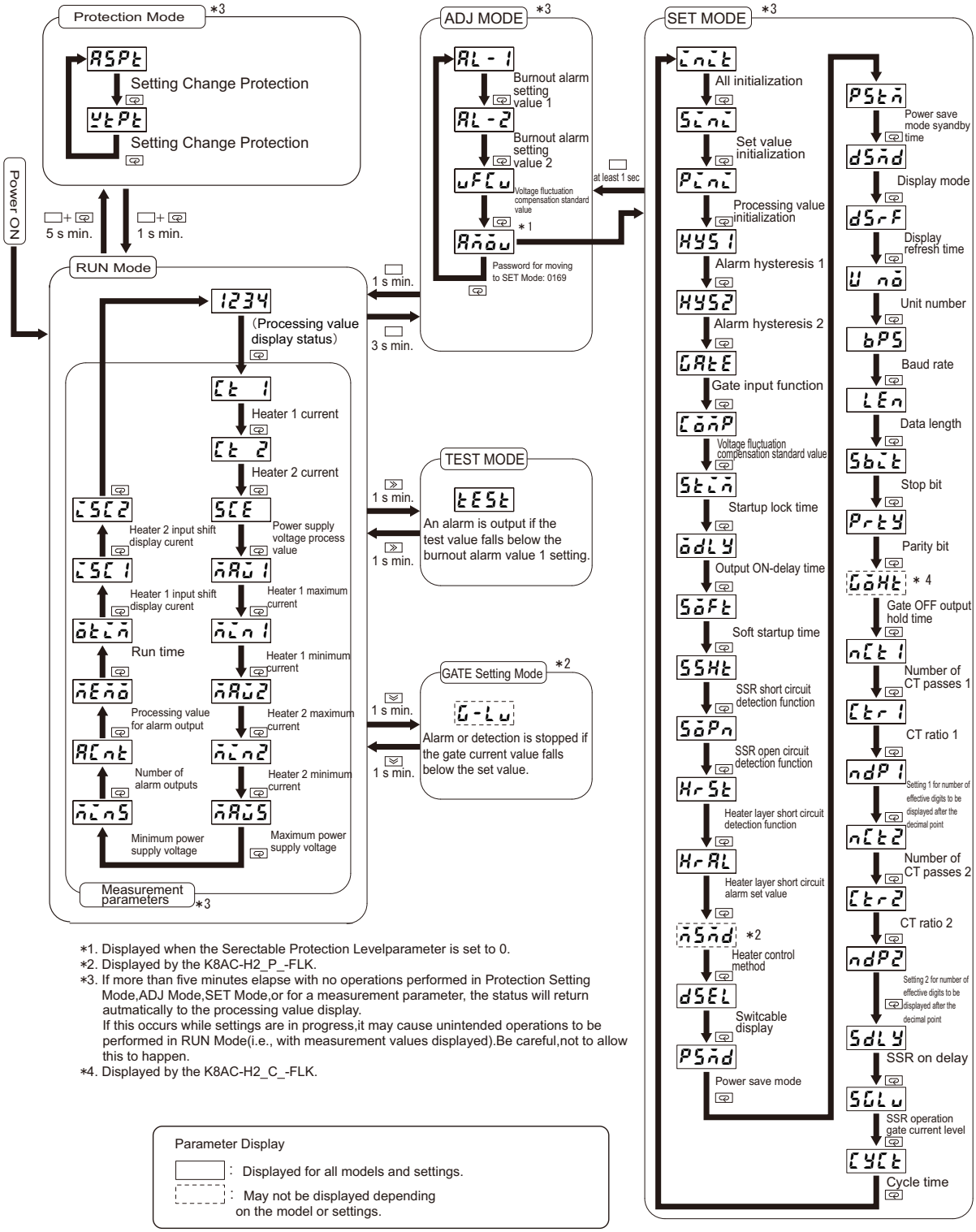
D. Use ≪, ⊻, and ≫ keys to set the password.
The password is 0169.

- Press the ⊏ key.
  If the password is correct, the mode will change to the SET Mode.
  If the password is incorrect, the next parameter will be displayed while still in ADJ Mode.



5.3 Parameters

The setting items in each mode are called “parameters”. Parameters can be switched by using the ↵ key.



∗1. Displayed when the Serectable Protection Levelparameter is set to 0.
∗2. Displayed by the K8AC-H2_P_-FLK.
∗3. If more than five minutes elapse with no operations performed in Protection Setting Mode,ADJ Mode,SET Mode,or for a measurement parameter, the status will return autmatically to the processing value display.
If this occurs while settings are in progress,it may cause unintended operations to be performed in RUN Mode(i.e., with measurement values displayed).Be careful,not to allow this to happen.
∗4. Displayed by the K8AC-H2_C_-FLK.

Parameter Display
: Displayed for all models and settings.
: May not be displayed depending on the model or settings.

■ Parameter Defaults and Description

Note: ▭ Shaded parameters must always be set regardless of the measurement method.

Item Mode	Parameter name		Description	Parameter	Setting range	Dafault
Protection-Mode	Setting Value Change Protection		Restricts access to ADJ Mode or SET-Mode from RUN Mode. 0: Access enabled to both ADJ Mode and SET Mode. 1: Access enabled to ADJ Mode and disabled to SET Mode. 2: Access disabled to both ADJ Mode and SET Mode.	ASPt	0 to 2	0
			Prohibits changes to set values.	KEPt	ON/OFF	OFF
ADJ Mode	Burnout Alarm Value 1	K8AC-H21	Sets the output operation value for the burnout alarm. The burnout alarm function can be disabled by setting the value to "-".	AL-1	0.200 to 2.200A	1.000A
		K8AC-H22			2.00 to 22.00A	10.00A
		K8AC-H23			20.0 to 200.0A	100.0A
	Burnout Alarm Value 2	K8AC-H21	Sets the output operation value for the burnout alarm. The burnout alarm function can by disabled by setting the value to "-".	AL-2	0.200 to 2.200A	1.000A
		K8AC-H22			2.00 to 22.00A	10.00A
		K8AC-H23			20.0 to 200.0A	100.0A
	Voltage Fluctuation Compensation Standard Value		Sets the standard voltage used by the voltage fluctuation compensation function. The fluctuation compensation function operates in respect to this set value.	uFCu	100 to 240 VAC	100V

Item Mode	Parameter name	Description	Parame-ter	Setting range	Dafault
SET Mode	All Initialization	Returns all set values and measurement values to their default settings.	initE	ON/OFF	OFF
	Set Value Initialization	Returns all set values to their initial settings.	SInI	ON/OFF	OFF
	Processing Value Initialization	Returns all set values to their default settings.	PInI	ON/OFF	OFF
	Alarm Hysteresis 1	Sets hysteresis for the alarm output value for burnout detection (undercurrent) and heater layer short circuits (overcurrent) for CT1.	HYS1	1 to 999	10
	Alarm Hysteresis 2	Sets hysteresis for the alarm output value for burnout detection (undercurrent) and heater layer short circuits (overcurrent) for CT2.	HYS2	1 to 999	10
	Gate Input Function	Turns the gate input function ON and OFF. If the gate input is turned OFF, application as a simple ammeter is possible.	GAtE	ON/OFF	ON
	Voltage Fluctuation Compensation Reference Value	Turns the voltage fluctuation compensation function ON and OFF.	CAnP	ON/OFF	OFF

Item Mode	Parameter name		Description	Parameter	Setting range	Dafault
SET Mode	Startup Lock Time		Sets the lock time for the startup lock.	St.ñ	0 (OFF) to 255s	0 (OFF)
	Output ON-Delay		Sets the output delay time. Set this parameter to set the operating time.	odLY	0.0 (OFF) to 99.9s	0.0 (OFF)
	Soft Startup Time		Sets the soft startup time. Set this parameter only when using a soft start function with the power regulator.	SoFt	0.0 (OFF) to 99.9s	0.0 (OFF)
	SSR Short Circuit Detection		Turns the SSR short circuit detection function ON and OFF.	SSHt	ON/OFF	OFF
	SSR Open Circuit Detection		Turns the SSR open circuit detection function ON and OFF.	SoPn	ON/OFF	OFF
	Heater Layer Short Circuit Detection (Overcurrent Detection)		Turns the heater layer short circuit (overcurrent) detection function ON and OFF.	HrSt	ON/OFF	OFF
	Heater Layer Short Circuit Alarm Level (Overcurrent Alarm Set Value)	K8AC-H21	Sets the operating level for heater layer short circuit (overcurrent) alarms. The heater layer short circuit alarm level is the same for both CT1 and CT2.	HrAL	0.200 to 2.200A	2.000A
		K8AC-H22			2.00 to 22.00A	20.00A
		K8AC-H23			20.0 to 200.0A	200.0A
	Heater Control Method ∗ 1		Sets the control method of the cyclic/phase control heater.	ñSñd	PH1/ PH3/ CYCL	PH1
	Switchable Display		Sets the CT for which to normally display the current.	dSEL	CT1/CT2	CT1
	Power Save Mode		Turns entering the power save mode ON and OFF.	PSñd	ON/OFF	OFF
	Power Save Mode Standdy-Time		Sets the time to enter power save mode.	PStñ	10 to 300s	60s
	Display Mode		Sets a 7-segment (NORM). full-span comparison (CMP), or (BAR) display.	dSñd	NORM/ CMP/ BAR	NORM
	Display Refresh Time		Sets the refresh time for the display.	dSrF	0.2s/0.5s/ 1.0s/ FAST	0.5s
	Unit Number		Sets the unit number for RS-485 communications.	U nñ	0 to 64	0
	Baud Rate		Sets the baud rate for RS-485 communications.	bPS	1200/ 2400/ 4800/ 9600/ 19200	9600

Item Mode	Parameter name	Description	Parameter	Setting range	Dafault
SET Mode	Data Length	Sets the data length for RS-485 communications.	LEn	7, 8	7
	Stop Bits	Sets the number of stop bits for RS-485 communications.	SbLt	1, 2	2
	Parity Bit	Sets the parity for RS-485 communications.	PrtY	EVEN, ODD, NONE	EVEN
	Gate OFF output hold time ∗2	Sets the time from when the gate signal gose OFF until the burnout alarm output turns OFF.	GoHt	0 to 999s	2s
	Number of CT passes 1t	Sets the number of times the conductor for CT1 is passed through the current transformer.	nCt 1	1 to 99 times	1 time
	CT Ratio 1	Sets the CT ratio for CT1.	Ctr 1	1 to 999	1
	Setting 1 for number of effective digits to be displayed after the decimal point	Sets the number of effective digits to be displayed after the decimal point for the CT1 current display.	ndP 1	∗4	∗5
	Number of CT passes 2	Sets the number of times the conductor for CT2 is passed through the current transformer.	nCt2	1 to 99 times	1 time
	CT Ratio 2	Sets the CT ratio for CT2.	Ctr2	1 to 999	1
	Setting 2 for number of effective digits to be displayed after the decimal point.	Sets the number of effective digits to be displayed after the decimal point for the CT2 current display.	ndP2	∗4	∗5
	SSR ON delay	Sets the SSR ON delay.	SdLY	0.0 to 99.9s	0.2s
	SSR operation gate current level ∗1	Sets the SSR operation gate current level.	SOLu	4.0 to 20.0mA	7.0mA
	Cycle time ∗6	Sets the cycle time.	CYCt	0.2 to 3.0s	0.2s
GATE Setting Mode	Gate Current Level ∗1	Sets the gate current value that stops an alarm, detection, or output. (This setting is only valid when phase control is selected as the heater controlmethod.)	G-Lu	7.0 to 20.0mA	7.0mA

∗1. This can be set only for K8AC-H2_P_-FLK (cyclic control/phase control).
∗2. The parameter of Gate OFF Output Hold Time can be set only for K8AC-H2_C_-FLK (ON/OFF control/SSR control).
∗3. The setting range varies depending on the setting of the scaling parameters (nCt 1, 2 Ctr 1, 2 ndP 1, 2). See 5-12 for details.
∗4. The setting range varies depending on the model.
K8AC-H21_ _-FLK:0000/0000/0000/0000.
K8AC-H22_ _-FLK:0000/0000/0000.
K8AC-H23C-FLK:0000/0000.
∗5. The initial value varies depending on the model.
K8AC-H21_ _-FLK:0000
K8AC-H22_ _-FLK:0000
K8AC-H23_ _-FLK:0000
∗6. Can be set only for the K8AC-H2_P_-FLK (cyclic control). The unit must be restarted after changing the setting.

5.4 Setting the Parameter

The value set for each parameter is called “set value”.
Set values include both numbers and characters.
The status when a set value is displayed is called “monitor status”, and when it can be changed it is called “change status”.
Use the following procedure to display and change set values.

Operation Procedure

A. Press the » key while a parameter is displayed to go into monitor status. The set value for that parameter will be displayed.

B. If the set value is not to be changed, press the ↵ key while in monitor status to switch to the next parameter.

C. Press the » key again while in monitor status to enable the changing the set value.

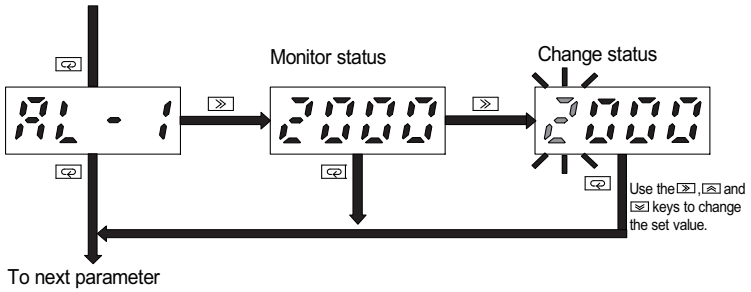
- The place where the set value can be changed will begin to flash.

D. Use the » ^ and v keys to change the set value.

E. Press the ↵ key is save the changed set value in internal memory and the switch to the next parameter.

- Changed set values will not be saved in memory if the mode is changed by another key operation without first pressing the ↵ key.

Note: If a set value is out of range, either too high or too low, the maximum or minimum value will automatically be set. For models with a current input of 0.200 to 2.200 A, for example, the maximum value is 2.200 and the minimum value is 0.200.



5.5 Measurement Display

Select the Heater 1 current value or Heater 2 current value to display the heater current value of either CT1 or CT2 as a process value.
By selecting a measurement parameter, an arbitrary measurement monitor value can also checked.

Operation procedure

A. When the ↵ key is pressed while the measurement value (Heater 1 current or Heater 2 current) is displayed, the measurement parameter will be displayed.

When the ↵ key is pressed in RUN Mode (with the process value being displayed), the measurement parameter for the Heater 1 current value will be displayed (CE 1).
To select a different measurement parameter, continue to press the ↵ key again.

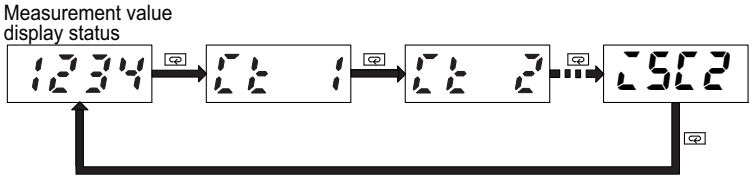
- Measurement values are the values of the heater current measured at CT1 or CT2.
- The factory initial setting for the measurement value is the Heater 1 current value.
- Measurement continues even while the measurement parameter is being displayed, and alarm operation will be performed.

B. When the » key is pressed while the measurement parameter is displayed, the measurement value or measurement monitor value will be displayed.

- The measurement monitor value cannot be continuously displayed. The display will be automatically returned to RUN Mode (with the measurement value being dislayed) if not performing operations for 5 minutes or more.

C. When the ↵ key is pressed, the next parameter will be displayed.

- The measurement parameter you want to display can be directly selected by pressing the M key several times continuously to switch parameter names.
- Continuously pressing the M key several times will go back to the measurement value display status.



Measurement Display Names and Characters/Parameter Names (Measurement Status Change)

Name	Key change	Character / Parameter name	Description
Heater 1 current	↵→	CT 1	Present CT 1 current measurement value
	≫←	CT1	
	↵ ↓		Changes to the next parameter
Heater 2 current	↵→	CT 2	Present CT 2 current measurement value
	≫←	CT2	
	↵ ↓		Changes to the next parameter
Power supply voltage	↵→	SCE	Present measurement value of the power supply voltage
	≫←	SOURCE	
	↵ ↓		Changes to the next parameter
Heater 1 maximum current	↵→	MAU 1	The maximum value from the power ON of CT1 to present
	≫←	MAX1	
	↵ ↓		Changes to the next parameter
Heater 1 minimum current	↵→	MIn 1	The minimum value from the power ON of CT1 to present
	≫←	MIN1	
	↵ ↓		Changes to the next parameter
Heater 2 maximum current	↵→	MAU2	The maximum value from the power ON of CT2 to present
	≫←	MAX2	
	↵ ↓		Changes to the next parameter
Heater 2 minimum current	↵→	MIn2	The minimum value from the power ON of CT2 to present
	≫←	MIN2	
	↵ ↓		Changes to the next parameter
Maximum power supply voltage	↵→	MAUS	The maximum value from the power supply voltage ON to present
	≫←	MAX SOURCE	
	↵ ↓		Changes to the next parameter

Name	Key change	Character Parameter name	Description
Minimum power supply voltage	↵ →	MIN SOURCE	The minimum value from the power supply voltage ON to present
	≫ ←		
		↵ ↓	Changes to the next parameter
Number of alarm outputs	↵ →	ALM COUNT	The total number of alarm outputs
	≫ ←		
		↵ ↓	Changes to the next parameter
Processing value for alarm output	↵ →	MEMO	CT1 or CT2 processing value for alarm output
	≫ ←		
		↵ ↓	Changes to the next parameter
Run time	↵ →	RUN TIME	The total run time value
	≫ ←		
		↵ ↓	Changes to the next parameter
Heater 1 input shift display current	↵ →	INPUT SHIFT CURRENT1	The shift value for the measurement of CT1 heater current
	≫ ←		
		↵ ↓	Changes to the next parameter
Heater 2 input shift display current	↵ →	INPUT SHIFT CURRENT2	The shift value for the measurement of CT2 heater current
	≫ ←		
		↵ ↓	Changes to the next parameter
		Returns to the processing value display.	

Memo

∗1. If more than five minutes elapse with no operations performed while the measurement parameter is displayed, the status will automatically return to RUN Mode (measurement value display status: Heater 1 current or Heater 2 current).

∗2. The above measurement values will be reset upon all initialization and measurement value initialization.

Processing Value Display Ranges and Functions

Processing value name	Display characters	Display range	Unit	Function
Heater 1 current	CT 1	0100 to 2300 *1 *2 *3	A	This is the CT1 heater current measurement value. Alarm operations such as the heater burnout alarm are determined based on this process value.
Heater 2 current	CT 2	0100 to 2300 *1 *2 *3	A	This is the CT2 heater current measurement value. Alarm operations such as the heater burnout alarm are determined based on this process value.

*1. The decimal point position and display range very depending on the model.
K8AC-H21_ _ :0.100 to 2.300
K8AC-H22_ _ :1.00 to 23.00
K8AC-H23_ _ :10.0 to 210.0

*2. If the display is below the minimum value, the bar display "----" will be shown, and if above the maximum value, the display will flash at the maximum value.
The display range varies depending on the setting of scaling parameters.The display range is determined by the following formula. The maximum display value, however, is 9999 digits.

*3. Display maximum value after scaling = Display maximum value x CT ratio/Number of CT passes
Display minimum value after scaling = Display minimum value x CT ratio/Number of CT passes

Measurement Monitor Value Display Ranges and Functions

Measurement monitor value nme	Display characters	Display range	Unit	Function
Power supply voltage	SCE	0085 to 0264	V	This is the measurement value of the K8AC-H power supply voltage. When the voltage fluctuation compensation function is enabled, the heater burnout determination based on this voltage is automatically compensated.
Heater 1 maximum current ＊1	hAU1	0100 to 2300	A	These hold the maximum and minimum values for each processing value. • The maximum and minimum heater currents after the power is turned ON or after a maximum or minimum reset are displayed. • The values are not saved when power is interrupted. • The current values are not refreshed when startup lock is in effect and when the gate input is enabled but the gate input is OFF. • Measurement values for power supply voltage are always refreshed.
Heater 1 minimum current ＊1	hLn1	0100 to 2300	A	
Heater 2 maximum current ＊1	hAU2	0100 to 2300	A	
Heater 2 minimum current ＊1	hLn2	0100 to 2300	A	
Maximum power supply voltage ＊1	hAU5	0085 to 0264	V	
Minimum power supply voltage ＊1	hLn5	0085 to 0264	V	
Number of alarm outputs	ALnE	0000 to 9999	outputs	This value counts the total number of alarms output for heater burnout, SSR open and short circuit, and heater layershorts. • The count is refreshed each time an alarm is output, and it is saved in non-volatile memory. • The value is saved when power is interrupted. • The number of outputs is not counted for the test function.
Processing value for alarm output	hEhd	0100 to 2300	A	This holds the CT1 or CT2 processing value when a heater burnout alarm is output. • This is the most recent processing value, and it is refreshed each time a heater burnout alarm occurs. • The value is not saved when power is interrupted.

Measurement monitor value nme	Display characters	Display range	Unit	Function
Run time	oEtn	0000 to 9999	× 10h	This is the total run time value from when power is turned ON or the processing value is reset until an alarm occurs. • The total time is recorded in non-volatile memory approximately once per hour. If power is interrupted within the hour, however, the data since the beginning of the hour is lost and the total starts over from when the time was last saved. • The total is stopped during heater burnout alarm output. When the alarm is cleared, the total resumes from the time just before the alarm occurred.
Heater 1 input shift display current *2	CSC1	-999 to 999	digit	This is the value for displaying the CT1 heater current measurement set in measurement parameter CT1. • The value is saved when power is interrupted.
Heater 2 input shift display current *2	CSC2	-999 to 999	digit	This is the value for displaying the CT2 heater current measurement set in measurement parameter CT2. • The value is saved when power is interrupted.

Note:

∗1. Each measurement value can be individually reset. For operation procedures, please refer to "5.7 Reset of Measurement Monitor Values."

∗2. The display range varies depending on the setting of scaling parameters.
The display range is determined by the following formula. The maximum display value, however, is 9999 digits.
Display maximum value after scaling = Display maximum value x CT ratio/Number of CT passes
Display minimum value after scaling = Display minimum value x CT ratio/Number of CT passes

5.6 Compensation of Processing Value Display

This function is used to compensate the measurement value of the Heater 1 current at CT1 (or the Heater 2 current at CT2) to an arbitrary display value. Use the following procedure for compensation.

Operation procedure

A. When the ↵ key is pressed while the measurement value is displayed, the measurement parameter will be displayed. Press the ↵ key several times to display the measurement parameter "CT 1" (or"CT 2").

B. When the S key is pressed while the measurement parameter "CT 1" (or"CT 2") is displayed, the status will enter the monitor status and the measurement value for the measurement parameter will be displayed.

C. When the ∧ key is pressed for at least three seconds in monitor status, the display will be in the change status, enabling changing to an arbitrary display value.

・The measurement value at the time of pressing the U key will be held.

D. The display value can be changed by the ∧,∨ and » keys.

・The display value can be compensated within the range between -999 and 999.

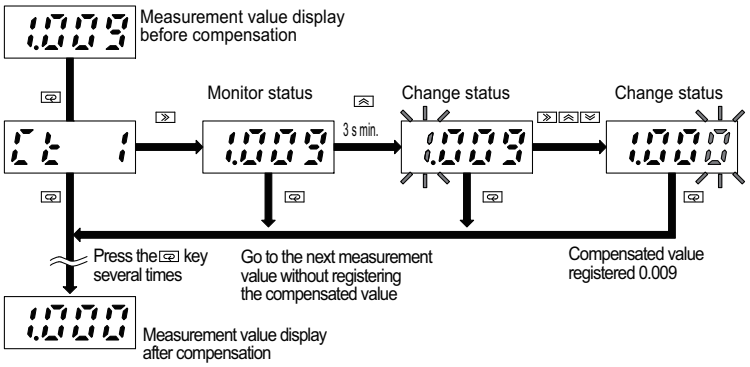
E. When the ↵ key is pressed, the compensated value will be registered.

・Compensated value for CT1 can be checked by the measurement parameter "CSC 1" ("CSC2" for CT2). For details on how to check, please see "5-5 Measurement Display".

・Compensated value for CT1 can be reset by the measurement parameter "CSC 1" ("CSC2" for CT2). For details on how toreset, please see "5-7 Reset of Measurement Monitor Values".

・When using the scaling function, if the magnification (= CT ratio/number of CT passes) is larger than 1, a setting error will occur due to rounding off.

・Ex) Magnification = 3, Compensated value = 100
The digits after the decimal point are rounded off and the result is obtained as 33. This is multiplied by the magnification 3. Real compensation value = 33 × 3 = 99


1.009
Measurement value display
before compensation
Monitor status
3 s min.
Change status
Change status
Ct 1
1.009
1.009
1.000
Press the key
several times
Go to the next measurement
value without registering
the compensated value
Compensated value
registered 0.009
1.000
Measurement value display
after compensation

5.7 Reset of Measurement Monitor Values

This function resets various kinds of maximum values and minimum values to the present values. The number of alarm outputs, measurement values at alarm output and run time are reset to “0”.

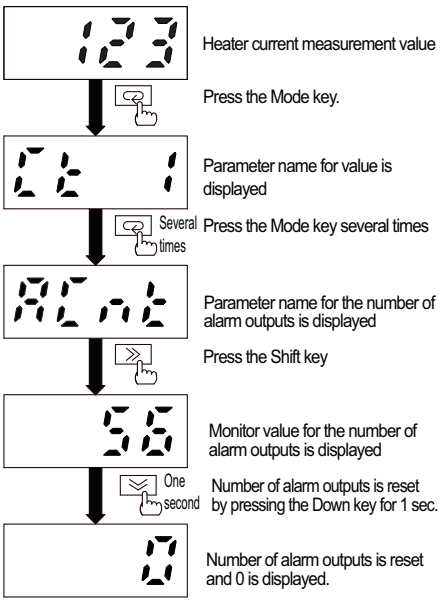
Operation procedure

A. When the ⏎ key is pressed while the measurement value is displayed, the measurement parameter will be displayed. Press the ⏎ key several times to display the measurement parameter.

B. When the » key is pressed while the measurement parame ter name is displayed, the status will enter the monitor status and the measurement value for that parameter will be displa- yed.

C. When the ⌄ key is pressed for at least one second in the monitor status, the memasurement value being displayed will be reset.

- Each maximum value or minimum value is reset to its present value.
- The number of alarm outputs, process values at alarm output and run time are reset to “0”.
- When the Heater 1 current, Heater 2 current or power supply voltage is displayed, the reset operation does not reset the value.
- Measurement restarts immediately after the execution of the reset operation.
- Reset is only valid for the measurement monitor value of the parameter being displayed.
- To reset all parameters, the function “Processing value initial- ization” in SET Mode is helpful.
- (See 5-33)


123
Heater current measurement value
Press the Mode key.
C1 1
Parameter name for value is displayed
Several times
Press the Mode key several times
AL no
Parameter name for the number of alarm outputs is displayed
Press the Shift key
56
Monitor value for the number of alarm outputs is displayed
One second
Number of alarm outputs is reset by pressing the Down key for 1 sec.
0
Number of alarm outputs is reset and 0 is displayed.

5.8 Alarm Indicators

When an alarm occurs, the alarm character and the measurement value will be displayed alternately in the main display area. The cause of the alarm occurrence can be identified by checking the displayed character.

List of alarm indicators

Order of priority	Alarm	7-segment display character	indicator	Alarm description
1	Heater burnout 1	H b E 1	ALM indicator lit	CT1 heater burnout detected.
2	Heater burnout 2	H b E 2	ALM indicator lit	CT2 heater burnout detected.
3	SSR open	S S r o	SSR indicator lit	SSR open detected (when heater current cannot be detected with temperature control gate output ON).
4	SSR short	S S r S	SSR indicator lit	SSR short circuit detected (when heater current is detected with temperature control gate output OFF).
5	Heater rea short 1	H r S 1	ALM indicator	CT1 overcurrent detected.
6	Heater rea short 2	H r S 2	ALM indicator	CT2 overcurrent detected.

Note:1. As soon as the cause of an alarm is removed, the alarm is reset automatically.
2. If multiple alarms occur simultaneously, the one with the highest priority is displayed.
3. If the mode is changed to ADJ or Set Mode while an alarm is in effect, the alarm output is reset and the ALM indicator and SSR indicator turn OFF.

5.9 Test Function

The test function is used to change the measurement value at CT1 as a simulation using keys to check the output operation. Current input or gate signal (with the gate input enabled) are not required.
The default for the test value is the present value.

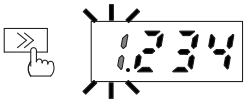
Operation procedure

A. Press the ≫ key for at least one second during RUN Mode to change to the test mode.

- The initial display "tESt" will be shown and ADJ indicator will flash.

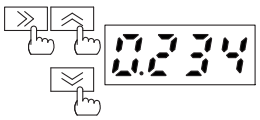
B. Press the ≫ key again.

- The test value will be displayed. (The latest measurement value before change will be displayed.)



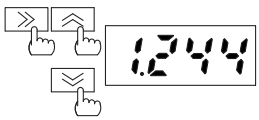
C. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



D. Use the ≪, ≫ and ≫ keys to change the test value to the burnout alarm value or smaller.

- If set below the burnout alarm value, an alarm output will be issued after the output time elapses.
  ∗If more than 120 seconds elapse with no operations performed, the status will return to the initial display for test mode "tESt".
- This does not work when the burnout alarm value "AL - 1" is set to "-".

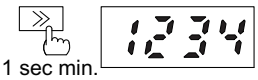


E. Use the ≪,≫ and ≫ key to change the test value to the return threshold value or greater.

- After changed to the return threshold value, the output will recover.
- The return threshold value is the burnout alarm value with the hysteresis added.

F. Press the ↩ key to return to the initial status for TEST mode "tESt".

- When returning to the initial status while the alarm output is issued in test mode, alarm output will automatically recover.



G. Press the ⏩ key for at least one second to return to RUN Mode.

- Be sure to perform the return operation to RUN Mode after the TEST mode is finished.
- After returned to RUN Mode, perform usual operations.

5.10 Setting Protection Function

The setting protection function can prevent set levels and values from being changed.

ASPt

This restricts the move to ADJ Mode or SET Mode.

Parameter	Set value	Move to ADJ Mode	Move to SET Mode	Move to GATE Mode *1
ASPt (ASPT)	0	Permitted	Permitted	Permitted
	1	Permitted	Forbidden	Permitted
	2	Forbidden	Forbidden	Forbidden

*1. Only available for cycle control or phase control K8AC-H2_P_-FLK types.

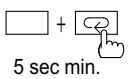
WtPt

When this protection is enabled, the change status for set values cannot be accessed. However, the following parameters can be changed.

- All parameters at protection level
- Move to SET Mode

Parameter	Set value	Setting change via key operation
WtPt (WTPT)	OFF	Permitted
	ON	Forbidden

Operation Procedure



ASPt

A. Press the □ and ↩ keys for at least five seconds during RUN Mode to change to the Protection Setting mode.

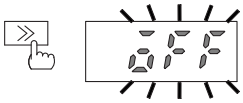
- The parameter will be displayed.

WtPt

B. Press the ↩ key several times to display the required parameter.

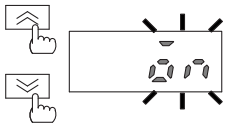
C. Press the the ≫ key to display the set value.

- The protection set value will be displayed.



D. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



E. The set value can be changed by the ≪ and ≫ keys.

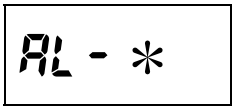
F. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory.

1 sec min.

G. Press the □ and ↵ keys for at least one second to return to RUN Mode.

5.11 Selecting Burnout Alarm Set Values



This sets the output operation value for the burnout alarm.
The setting is performed for each input, and when the input current falls below the set value of this parameter, a burnout alarm will be output.

Parameter	Set value	Set value description
AL - 1 (AL-1)	The setting range varies depending on the model. K8AC-H21_ _ 0.200 to 2.200 K8AC-H22_ _ 2.00 to 22.00 K8AC-H23_ _ 20.0 to 200.0	Output operation vale for Burnout alarm setting 1 (alarm against the current input1)
AL - 2 (AL-2)		Output operation vale for Burnout alarm setting 2 (alarm against the current input2)

Note: 1. To disable burnout alarm, set the rightmost digit to "-".

2. Ex.) K8AC-H21 _ _ _
   If a set value is out of range, the maximum or minimum value will automatically set.
   When A < 0.200 to 2.200 < B, the setting will be as follows:
   A=0.200
   B=2.200
3. When only CT-1 is used for single-phase heater monitoring instead of CT-2, set " - " for the CT-2 detection current value to disable it.
4. When using the scaling function, the setting range varies depending on the CT ratio, the number CT passes and setting for the number of effective digits to be displayed after the decimal point.
   Minimum set value = minimum value within the range x CT ratio / number of CT passes
   Maximum set value = maximum value within the range x CT ratio / number of CT passes
   (AL-1 is affected by the CT ratio 1, the number of CT passes 1 and the setting 1 for number of effective digits to be displayed after the decimal point. AL-2 is affected by the CT ratio 2, the number of CT passes 2 and the setting 2 for number of effective digits to be displayed after the decimal point.)
5. Make sure that the power regulator is at 100% output when adjusting the set burnout alarm value.

Operation procedure

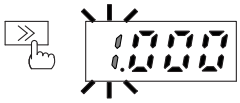
A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ⏎ key several times to display the parameter “AL-1” .

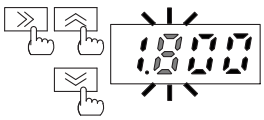
C. Press the ≫ key to display the set value.

- The set value for the Burnout Alarm 1 will be displayed.



D. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



E. The set value can be changed by the ≪,≪ and ≫ keys.

F. Press the ⏎ key to switch to the next parameter “AL-2”.

- The set value changed will be registered to the internal memory and “AL-2” will be displayed. Change the set value the same way as in C. to E.

G. After changing the setting for “AL-2” and pressing the ⏎ key, the next parameter “uFCu” will be displayed.

H. Press the □ key for at least one second to return to RUN Mode.

Teaching of the burnout alarm set values

The teaching function allows setting of parameters "AL - 1" and "AL -2" using actual inputs.

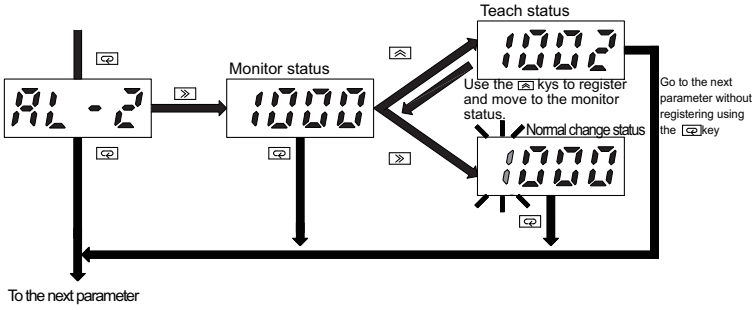
Operation procedure

I. The operation in C. will bring you to the monitor status. Press the ⌃ key in the monitor status instead of performing the operation in D.

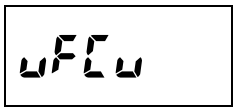
- You will enter the teaching status where an actual input changes the set value accordingly.

J. Press the ⌃ key again.

- The input value will be registered as a set value and you will return to the monitor status.
- Pressing the ↵ key instead of the ⌃ key during the teaching status will cancel the teaching and the display will be switched to the next parameter.



5.12 Selecting Voltage Fluctuation Compensation Standard Value



This sets the standard value for voltage fluctuation compensation.
Based on the set value for this parameter, the actual fluctuation ratio of power supply voltage will be reflected to the alarm output value.

Parameter	Set value	Set value description
uFCu (VFCV)	100 to 240	Standard value for voltage fluctuation compensation

Operation procedure

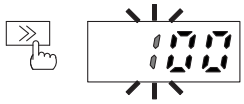
A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ⇆ key several times to display the parameter “uFCu”.

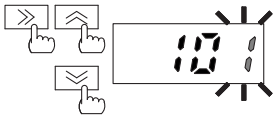
C. Press the ≫ key to display the set value.

- The set value for the voltage fluctuation compensation will be displayed.



D. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



E. The set value can be changed by the ≪, ≪ and S keys.

F. Press the ↵ key to switch to the next parameter "Año".

・ The set value changed will be registered to the internal memory and "Año" will be displayed.

G. Press the □ key for at least one second to return to RUN Mode.

Teaching of the standard value for voltage fluctuation compensation standerd value.
The teaching function allows setting of the parameter "uFC" using actual inputs.

Operation procedure

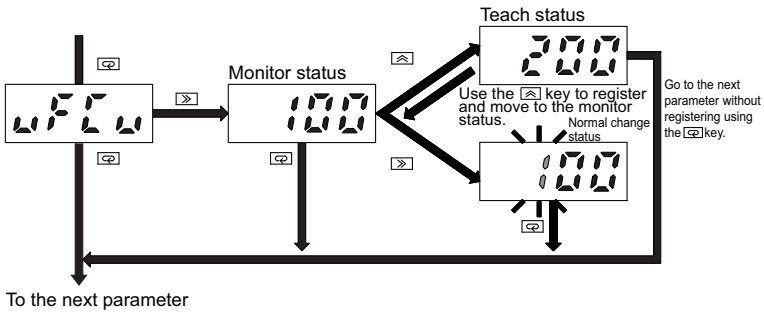
H. The operation in C. will bring you to the monitor status. Press the ∧ key instead of performing the operation in D.

・ You will enter the teaching status where an actual input changes the set value accordingly.

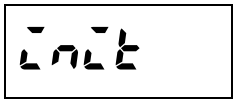
I. Press the ∧ key again.

・ The input value will be registered as a set value and you will return to the monitor status.

・ Pressing the ↵ key instead of the ∧ key during the teach-
ing status will cancel the teaching and the display will be switched to the next parameter.



5.13 All Initialization



This function returns all set values and measurement values to their default settings.

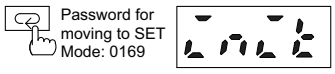
Parameter	Set value	Set value description
INIT (INIT)	OFF	---
	ON	Initializes set values and processing values

This is useful when needing to redo the setting from the initial factory setting.
For the values at the initial factory setting, please see the “Parameter List” in the back of this manual.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

・ The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
・ The parameter will be displayed.

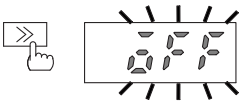


B. Press the ⊂⊃ key several times to display the parameter “Pass”.
Set the password “0169” for the parameter “Pass” to move to SET Mode.
For details on how to move between modes, please see “5.2 Moving between Modes”.

・ The “ADJ” indicator will be unlit and “SET” indicator will be lit.
・ The first parameter “INIT” will be displayed.

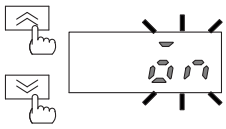
C. Press the » key to display the set value.

・ The set value “OFF” will be displayed.

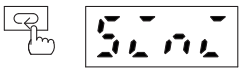


D. Press the » key again.

・ The status will enter the change status and the set value will start to flash.



E. Set the value as “ON” using the ▲ and ▼ keys.



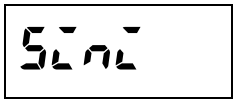
F. Press the ↵ key to switch to the next parameter.

- Set values and measurement values will be all cleared.
- The parameter “InIt” will also be set to “OFF”.
- After the setting is complete, the next parameter “SInI” will be displayed.

G. Press the □ key for at least one second to return to ADJ Mode.

H. Press the □ key for at least one second to return to RUN Mode.

5.14 Set Value Initialization



This function returns all set values to their default settings.

Parameter	Set value	Set value description
SINI (SINI)	OFF	No initialization
	ON	Executes initialization of set values

This is useful when needing to redo the setting from the initial factory setting.
For the values at the initial factory setting, please see the “Parameter List” in the back of this manual.

- Target parameters
  All parameters in ADJ Mode
  All parameters in SET Mode
  Operation gate current level
  All parameters excluding “number of alarm outputs” and “run time”.

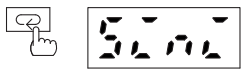
Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ⊏ key several times to display the parameter “ADOW”.
Set the password “0169” for the parameter "ADOW" to move to SET Mode.
For details on how to move between modes, please see “5.2 Moving between Modes”.

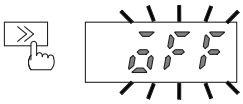
- The “ADJ” indicator will be unlit and “SET” indicator will be lit.



C. Press the ⊏ key several times to display the parameter “SINI”.

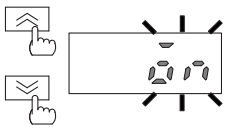
D. Press the ≫ key to display the set value.

- The set value “OFF” will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. Set the value as “ON” using the ≪ and ≪ keys.

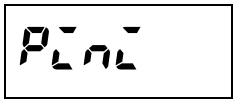
G. Press the ↵ key to switch to the next parameter.

- Set values will be all cleared.
- The parameter “SCnL” will also be set to “OFF”.
- After the setting is complete, the next parameter “PCnL” will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.15 Processing Value Initialization



This function returns all process values to their default settings.

Parameter	Set value	Set value description
PINI (PINI)	OFF	---
	ON	Executes initialization of process data.

This is useful when needing to monitor various measurement data held by K8AC from the initial status.

・ Target parameters
Heater 1 maximum current value
Heater 1 minimum current value
Heater 2 maximum current value
Heater 2 minimum current value
Maximum power supply voltage value
Minimum power supply voltage value
Number of alarm outputs
Measurement value at alarm output
Run time

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

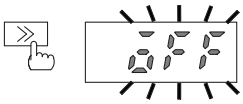
B. Press the ⊂ key several times to display the parameter “ADJU”.
Set the password “0169” for the parameter “ADJU” to move to SET Mode.
For details on please see “5.2 Moving between Modes”.

- The “ADJ” LED will be unlit and “SET” indicator will be lit.

C. Press the ⊂ key several times to display the parameter “PINI”.

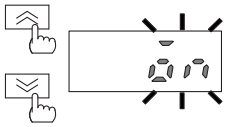
B. Press the ≫ key to display the set value.

- The set value “OFF” will be displayed.



C. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



D. Set the value to “ON” using the ∧ and ∨ keys.

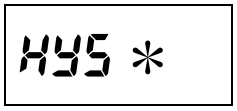
E. Press the ↵ key to switch to the next parameter.

- Set values will be all cleared.
- The parameter “PLnL” will also be set to “OFF”.
- After the setting is complete, the next parameter “HYS 1” will be displayed.

F. Press the □ key for at least one second to return to ADJ Mode.

G. Press the □ key for at least one second to return to RUN Mode.

5.16 Setting of Alarm Hysteresis



This function sets the hysteresis for the alarm output value.
The hysteresis values can be individually set for Input 1 and Input 2.

Parameter	Set value	Set value description
HYS 1 (HYS1)	001 to 999	Sets hysteresis for the burnout alarm set value 1 and heater layer short circuits alarm level (Input 1).
HYS2 (HYS2)	001 to 999	Sets hysteresis for the burnout alarm set value 2 and heater layer short circuits alarm level (Input 2).

Note: 1. When using the scaling function, if the magnification is set to larger than 1, a setting error will occur due to rounding off. So please set multiple numbers.
Method calculating the setting error
Ex) Magnification = 2, hysteresis = 11
11 ÷ 2 = 5.5
The digits after the decimal point are rounded off and the result is obtained as 5.
This is multiplied by the magnification 2.
Real hysteresis = 5 × 2 = 10

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicatoe will be lit.
- The parameter will be displayed.

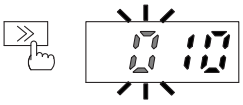
B. Press the ⏎ key several times to display the parameter "AMOD".
Set the password "0169" for the parameter "AMOD" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ⏎ key several times to display the parameter "HYS 1".

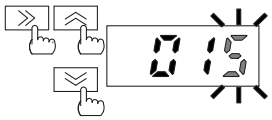
D. Press the ≫ key to display the set value.

・ The set value for Hysteresis 1 will be displayed.



E. Press the ≫ key again.

・ The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪, ≪ and ≫ keys.

G. Press the ↵ key to switch to the next parameter.

・ The set value changed will be registered to the internal memory an "HYS2" will be displayed.

H. Repeat D. to G. to set "HYS2".

・ After changing the setting and pressing the ↵ key, the next parameter "CALC" will be displayed.

I. Press the □ key for at least one second to return to ADJ Mode.

J. Press the □ key for at least one second to return to RUN Mode.

5.17 Setting of Gate Input Function

GATE

This turns the gate input function ON anf OFF.

Parameter	Set value	Set value description
GATE (GATE)	OFF	Turns OFF the gate input function (always detect burnout)
	ON	Turns ON the gate input function (detect burnout only when the gate input is turned on)

The gate input function is used to determine the correlation between the gate input and the alarm operation.
The correlation between the gate setting/gate input and the alarm operation is as follows:

Gate input function setting	Gate input	Available alarm operation			
		Burnout detection	SSR short circuit detection	SSR open detection	Heater layer short circuit detection
OFF	Disabled	○	×	×	○
ON	Enabled	○	○	○	○

Note: To detect burnout correctly, the gate function must be turned ON. When the gate function is turned OFF, its measurement accuracy cannot be guaranteed. So, be sure to always turn ON the gate function except for cases such as maintenance or output check during mounting.

Operation procedure

three sec min. AL-1

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicator will be lit.
- The parameter will be displayed.

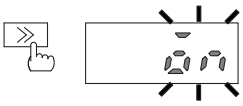
B. Press the ⏎ key several times to display the parameter amov. Set the password “0169” for the parameter “amov” to move to SET Mode.
For details on how to move between modes, please see “5.2 Moving between Modes”.

・ The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “GATE”

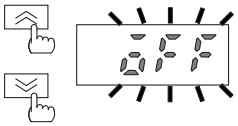
D. Press the ≫ key to display the set value.

・ The set value for the gate function will be displayed.



E. Press the ≫ key again.

・ The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ and ⩔ keys.

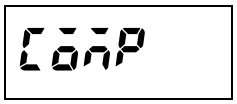
G. Press the ⏎ key to switch to the next parameter.

・ The set value changed will be registered to the internal memory and ”comp” will be displayed.

H. Press the ▭ key for at least one second to return to ADJ Mode.

I. Press the ▭ key for at least one second to return to RUN Mode.

5.18 Setting of Voltage Fluctuation Compensation Function



This turns the voltage fluctuation compensation function ON and OFF.

Parameter	Set value	Set value description
CoMP (COMP)	OFF	Turns OFF the voltage fluctuation compensation function
	ON	Turns ON the voltage fluctuation compensation function

The voltage fluctuation compensation function adjusts the threshold of an alarm operation in accordance with the power supply voltage to prevent faulty operation that could occur due to the current value change caused by voltage fluctuation.
This function reflects the ratio of the present voltage value against the “voltage fluctuation compensation standard value” (for details, see “5.12 Selecting Voltage Fluctuation Compensation Standard Value”) to the threshold of the alarm operation.
For example,
Voltage fluctuation compensation standard value: 100
Power supply voltage: 112V (100 x 1.12)
Burnout alarm value 1: 1.000
The threshold for Burnout Alarm 1 will be compensated for fluctuation to 1.120 (1.000 x 1.12)

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

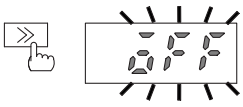
B. Press the ⏎ key several times to display the parameter “ANOU”.
Set the password “0169” for the parameter “ANOU” to move to SET Mode.
For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ↵ key several times to display the parameter "CoMP" .

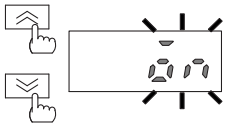
D. Press the » key to display the set value.

- The set value for the voltage fluctuation compensation function will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ^ and v keys.

G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "SECn" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.19 Setting of Startup Lock Time

This sets the startup lock time.

Parameter	Set value	Set value description
STIM (STIM)	0 (OFF) to 255	Locks the output operation during startup for the set time period. 0: No startup lock 1 to 255 : 1 sec to 255 sec

The startup lock time is a function to lock the output operation to prevent faulty operation due to unstable inputs during startup. Even when reaching the alarm output level for input status during startup, output operation will not be performed until the set time elapses.
(Note: Startup means when the power supply to the K8AC is turned on.)

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indocator will be lit.
- The parameter will be displayed.

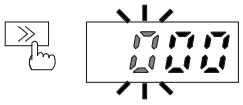
B. Press the ⏎ key several times to display the parameter “ADJ” Set the password “0169” for the parameter “ADJ” to move to SET Mode.
For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicotor will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “STIM”.

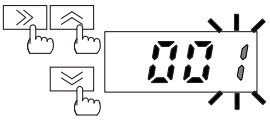
D. Press the ≫ key to display the set value.

- The set value for the startup lock time will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓, ⩔ and ⩕ keys.

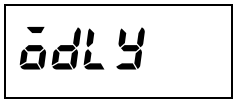
G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "adLy" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.20 Setting of Output ON Delay Time



This function sets the output delay time.

Parameter	Set value	Set value description
oDLY (ODLY)	0.0 (OFF) to 99.9	Output ON delay time 0.0 (= OFF): ON delay disabled 0.1 to 99.9: 0.1 sec to 99.9 sec

Output ON delay time indicates the standby time before the output operation starts.
When the ON/OFF control heater is turned off, its output operation starts in 0.5 seconds or less (3.5 seconds or less for phase and cyclic control heaters). This time period can be delayed by the setting.
(Note: Output start time is set value plus 0.5 seconds for phase and cyclic heaters, plus 3.5 seconds).
For example, when the set value is “15.0” the output start time will be about 15.5 seconds (for phase and cyclic heaters, about 18.5 seconds).

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

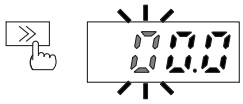
B. Press the ⇆ key several times to display the parameter “AMOd”.
Set the password “0169” for the parameter “AMOd” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⇆ key several times to display the parameter “oDLY”.

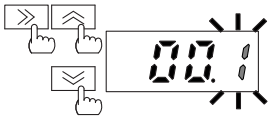
D. Press the ≫ key to display the set value.

- The set value for the ON delay time will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪,≫ and ≫ keys.

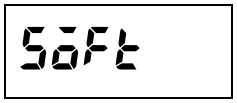
G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "SAFE" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.21 Setting of Soft Startup Time



This function sets the soft startup time.

Parameter	Set value	Set value description
SoFt (SOFT)	0.0 (OFF) to 99.9	Soft Startup Time 0.0 (= OFF): soft startup disabled 0.1 to 99.9: 0.1 sec to 99.9 sec

The soft startup time is a function to adjust the standby time before burnout detection begins after the gate function is turned on. If the soft startup function is enabled with a power conditioner, the peak current increases gradually, so the current value at the rise time will be below the heater burnout detection value. The soft startup time prevents faulty output due to the rising current during soft startup. When using the soft startup function with a power conditioner, set the time suitable for the soft startup of the power conditioner.
If the heater control method is ON/OFF type, set the soft startup time to 200 ms (0.2 seconds) or more. If the heater ON time is less than 200ms, this function cannot be used.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

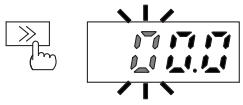
B. Press then key several times to display the parameter “AAdJ” .
Set the password “0169” for the parameter “AAdJ” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the key several times to display the parameter “SoFt” .

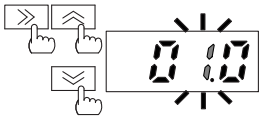
D. Press the ≫ key to display the set value.

- The set value for the soft startup time will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪, ≪ and ≫ keys.

G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "SSRt" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.22 Setting of SSR Short Circuit Detection Function

SSHt

This function turns the SSR short circuit detection function ON and OFF.

Parameter	Set value	Set value description
SSHt (SSHT)	OFF	SSR Short Circuit Detection is turned OFF
	ON	SSR Short Circuit Detection is turned ON

The SSR short circuit detection function is used to determine the status that the heater current input is exceeding the criteria as SSR short circuit (SSR is short-circuited) and output an alarm.
The criteria for the current input level is as follows.

SSR control method	Gate OFF criteria	Current input level criteria
ON/OFF control	Gate pulse OFF	The current input is more than 45 percent of the minimum value in the range.
Phase control	Gate input current 4mA or less	The current input is more than 45 percent of the minimum value in the range.
Cyclic control	Gate input current 4mA or less	The current input is more than 45 percent of the minimum value in the range.

Note: If the gate input is set to OFF, an alarm will not be output even when turning the SSR short circuit detection function ON. (For information on the gate input function, please refer to “5.17 Setting of Gate Input Function”.

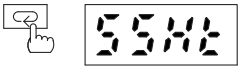
Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ↵ key several times to display the parameter "Ano4". Set the password "0169" for the parameter "Ano4" to move to SET Mode. For details, please see "5.2 Moving between Modes".

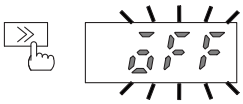
- The "ADJ" indicator will be unlit and "SET" indicator will be lit.



C. Press the ↵ key several times to display the parameter "SSHt".

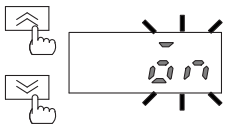
D. Press the » key to display the set value.

- The set value for the SSR short circuit detection will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ^ and v keys.

G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "SoPn" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.23 Setting of SSR Open Circuit Detection Function

This function turns the SSR open circuit detection function ON and OFF.

Parameter	Set value	Set value description
SoPn (SOPN)	OFF	SSR Open Detection function is turned OFF
	ON	SSR Open Detection function is turned ON

SSR Open Detection function is turned ON.
The SSR short open detection function is used to determine the status that the heater current input is below the criteria as SSR open (SSR is burned out) and output an alarm.
The current input criteria are as follows.
Note: If the gate input function is set to OFF, an alarm will not be output even when turning the SSR open detection function ON. (For information on the gate input function, please refer to “5.17 Setting of Gate Input Function”.)

SSR control method	Gate ON criteria	Current input level criteria
ON/OFF control	Gate pulse ON	The current input is more than 45 percent of the minimum value in the range.
Phase control	Exceeding the gate input current 7mA ∗1	The current input is more than 45 percent of the minimum value in the range.
Cyclic control	Exceeding the gate input current 7mA ∗1	The current input is more than 45 percent of the minimum value in the range.

Note 1: For phase control and cyclic control heaters, the setting of the operation gate current level must be observed.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The ”RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

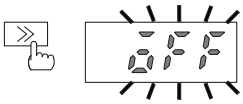
B. Press the ↩ key several times to display the parameter "Ano".
Set the password "0169" for the parameter "Ano" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator LED will be lit.

C. Press the ↩ key several times to display the parameter "SoPn".

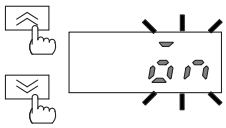
D. Press the ≫ key to display the set value.

- The set value for the SSR open detection will be displayed.

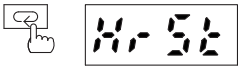


E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ∧ and ∨ keys.



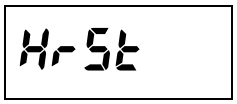
G. Press the ↩ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "Hr-St" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.24 Setting of Heater Layer Short Circuit Detection Function



This turns the heater layer short circuit detection function ON and OFF.

Parameter	Set value	Set value description
Hr5t (HRST)	OFF	Heater Layer Short Circuit Detection Function is turned OFF
	ON	Heater Layer Short Circuit Detection Function is turned ON

The Heater Layer Short Circuit Detection function is used to detect an overcurrent status of the heater current inputs. The threshold value for the alarm output can be arbitrarily set using the "heater layer short circuit alarm value". (Please refer to "5.25 Setting of Heater Layer Short Circuit Alarm Level" for details.)

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit "ADJ" indicator will be lit.
- The parameter will be displayed.

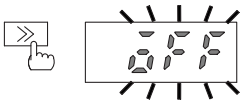
B. Press the ⇆ key several times to display the parameter "Aadj". Set the password "0169" for the parameter "Aadj" to move to SET Mode. For ditails, please see "5.2 Moving between Modes."

- The "ADJ" LED will be unlit and "SET" indicator will be lit.

C. Press the ⇆ key several times to display the parameter "Hr5t".

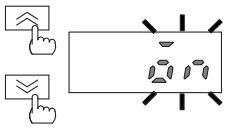
D. Press the ⇉ key to display the set value.

- The set value for the heater layer short circuit detection will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪ and ≪ keys.

G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "H-AL" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press tha □ key for at least one second to return to RUN Mode.

5.25 Setting of Heater Layer Short Circuit Alarm Level

H-AL

This function sets the heater layer short circuit alarm level.

Parameter	Set value	Set value description
H-AL (HRAL)	The setting range varies depending on the model. (See Note.) K8AC-H21_ _ 0.200 to 2.200 K8AC-H22_ _ 2.00 to 22.00 K8AC-H23_ _ 20.0 to 200.0	Threshold value for the heater layer short circuit alarm output

The heater layer short circuit alarm level is a function to detect an overcurrent status of the heater current input and output an alarm. Only when the heater layer short circuit detection function is set to ON, the heater layer short circuit alarm level can be set. (Please see “5.24 Setting of Heater Layer Short Circuit Detection Function”).

The threshold value for the alarm level is determined by this parameter setting both for Input 1 and 2. For recovery from the alarm, the value set in the alarm hysteresis will be applied. (Please see “5.16 Setting of Alarm Hysteresis”.)

Note: When using the scaling function, the setting range varies depending on the CT ratio, the number CT passes and setting for the number of effective digits to be displayed after the decimal point.

Minimum set value = minimum value within the range x CT ratio / number of CT passes
Maximum set value = maximum value within the range x CT ratio / number of CT passes
(AL-1 is affected by the CT ratio 1, the number of CT passes 1 and the setting 1 for number of effective digits to be displayed after the decimal point. AL-2 is affected by the CT ratio 2, the number of CT passes 2 and the setting 2 for number of effective digits to be displayed after the decimal point.)

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ↵ key several times to display the parameter "Ano" . Set the password "0169" for the parameter "Ano" to move to SET Mode. For details, please see "5.2 Moving between Modes".

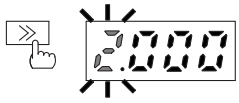
- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ↵ key several times to display the parameter "Hr-AL" .

This is the case of H21_ _.

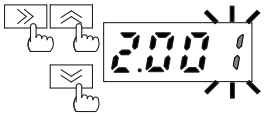
D. Press the » key to display the set value.

- The set value for the heater layer short circuit alarm will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ^ and » keys.

Phase or cyclic control type

G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "nSnd" will be displayed for phase or cyclic control heaters and "dSEL" for ON/OFF control heaters.

ON/OFF control heaters

H. Press the key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.26 Selection of Heater Control Method

(Only for phase and cyclic control type K8AC-H2_ _P_)

This function is used to select the control method of your heater.

Parameter	Set value	Set value description
MSMD (MSMD)	PH-1	Phase control (single-phase detection) (SSR control method is phase control)
	PH-3	Phase control (three-phase detection) (SSR control method is phase control)
	CYCL	Cyclic control (SSR control method is cyclic control)

Set according to the heater current control method.

Note:1. Select an appropriate control method for accurate measurement and alarm operation.

Note:2. For phase control heaters, compensate the burnout alarm value following the output volume that fluctuates per half a cycle.

Operation procedure

A. Press the ☐ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

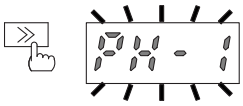
B. Press the ↩ key several times to display the parameter “A000”. Set the password “0169” for the parameter “A000” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ↩ key several times to display the parameter “MSMD” .

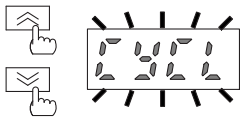
D. Press the ≫ key to display the set value.

- The set value for the heater layer short circuit detection will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪ and ≪ keys.

G. Press the ↩ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "dSEL" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.27 Setting of Switch Display

dSEL

This function sets the CT for which to normally display the current.

Parameter	Set value	Set value description
dSEL (DSEL)	CT1	Current input 1
	CT2	Current input 2

Select the heater current measurement value to be continuously displayed in RUN Mode.

Operation procedure

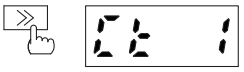
A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicator will be lit.
- The parameter will be displayed.

B. Press the ⏎ key several times to display the parameter "Aadu". Set the password "0169" for the parameter "Aadu" to move to SET Mode. For details, please see "5.2 Moving between Modes".

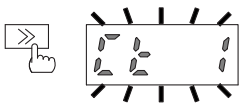
- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ⏎ key several times to display the parameter "dSEL".



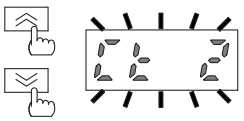
D. Press the » key to display the set value.

- The set value for the continuously displayed processing value will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by and the ⩓ and ⩔ keys.

G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "PSAd" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.28 Setting of Power Save Mode

PSAd

This turns entering the power save mode ON and OFF .

Parameter	Set value	Set value description
PSAd (PSMD)	ON	Power Save Operation is turned ON.
	OFF	Power Save Operation is turned OFF.

The power save operation is a function to turn off the light of the main display if no operation is performed for a certain time period.
The operation time is set in “5.29 Setting of Power Save Operation Time”.
The display light turned off by the power save operation can be lit again by pressing any key.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

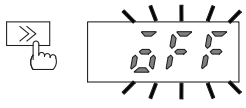
B. Press the ⏎ key several times to display the parameter “AAAu”. Set the password “0169” for the parameter “AAAu” to move to SET Mode. For details, please see 5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “PSAd” .

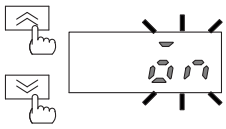
D. Press the » key to display the set value.

- The set value for the power save operation will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ and ⩔ keys.

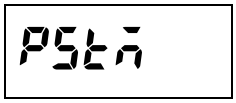
G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "PSEn" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.29 Setting of Power Save Mode Standby Time



This function sets the time enter power save mode.

Parameter	Set value	Set value description
PStA (PSTM)	10 to 300	Power Save Operation time 10 to 300 :10 sec to 300 sec

The power save operation time is the time period during which only the light of the main display is turned off after the set time elapses.
The power save operation can be enabled / disabled in “5.28 Setting of Power Save Mode Standby”.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

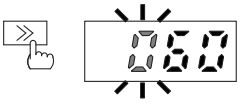
B. Press the ⏎ key several times to display the parameter “AnAu”. Set the password “0169” for the parameter “AnAu” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “PStA”.

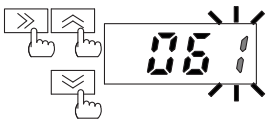
D. Press the ≫ key to display the set value.

- The set value for the power save operation time will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ , ⩔ and ⩕ keys.

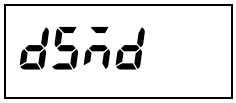
G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "dSAd" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.30 Setting of Display Mode



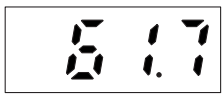
This function is used to select the display mode.

Parameter	Set value	Set value description
dSñd (DSMD)	NORM	Processing value display (Displays the measurement value as it is)
	CMP	Ratio display (Displays the ratio (%) of the measurement value against the burnout alarm value)
	BAR	Bar display (Displays the bar representing the ratio of the measurement value against the burnout alarm value)

This selects the display method for the measurement value displayed in the basic display status of RUN Mode.
Each display method is described below.

・ Processing value display method
Displays the measurement value as it is. For example, when the measurement value is 1.234 (A), the display is shown as in the following figure. (Note: The position of the decimal point is fixed depending on the model.)

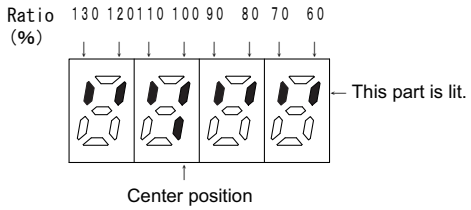
・ Ratio display method
Displays the measurement value in the ratio (%) against the heater burnout alarm set value. When the heater burnout alarm set value is 2.000 (A) and the measurement value is 1.234 (A), the display will be shown as in the following figure.



・ Bar display method

Displays the measurment value in the ratio (%) against the heater burnout alarm set value using a bar representation.

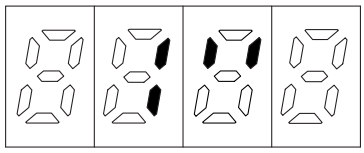
As shown in the following figure, how large or small the value is shown with the ratio 100% at the center.



With the value at the center as a standard value, when the “set value is smaller than the measurement value”, the indicator moves to the left from the center, and when the “set value is larger than the measurement value”, the indicator moves to the right.

The farther from the center value, the more number of the bars, and when the ratio is in the display range smaller than the measurement value, the bars at the left from the canter will all flash. When the ratio is in the display range larger than the measurement value, the bars at the right from the center will all flash.

When the heater burnout alarm set value is 2.000 (A) and the measurement value is 1.534 (A), the display will be shown as in the following figure. (Ratio = 76.7%)



Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

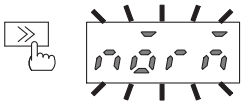
B. Press the ⏎ key several times to display the parameter “AAdJ”. Set the password “0169” for the parameter “AAdJ” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “dSAd”.

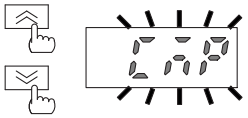
D. Press the ≫ key to display the set value.

- The set value for the display method will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪ and ≪ keys.

G. Press the ↩ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "dSrF" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.31 Setting of Display Refresh Time

dSrF

This sets the display refresh time.

Parameter	Set value	Set value description
dSrF (DSRF)	0. 2	0.2s
	0. 5	0.5s
	1. 0	1.0s
	FAST	Real time update

This sets the display update frequency for the measurement value display in RUN Mode. The display refresh is a function to slow the update frequency for less flickering, making the display easy to see.
The measurement value will be updated each time period selected.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

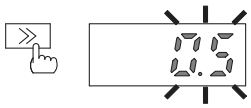
B. Press the ⏎ key several times to display the parameter “AnOu”.
Set the password “0169” for the parameter “AnOu” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “dSrF”.

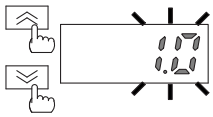
D. Press the ≫ key to display the set value.

- The set value for the display refresh will be displayed.

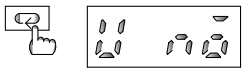


E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪ and ≪ keys.



G. Press the ↵ key to switch to the next parameter.

- The changed set value will be registered to the internal memory and "End" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.32 Setting of Unit Number

This sets the unit number for serial communications.

Parameter	Set value	Set value description
U no (U NO)	0 to 64	Unit No. for communications

The unit number is a unique number for each device connected to the same RS-485 line.
The number can be specified within the range between 0 and 64. However, if multiple devices with the same unit number are installed on the same line, communication will not be correctly performed.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

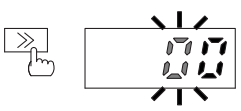
B. Press the ⏎ key several times to display the parameter “Ano4”.
Set the password “0169” for the parameter “Ano4” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “U no”.

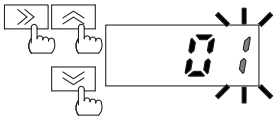
D. Press the ≫ key to display the set value.

- The set value for the unit number will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⏶ , ⏷ and ⏭ keys.

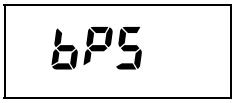
G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "bPS" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.33 Setting of Baud Rate



This sets the baud rate for serial communications.

Parameter	Set value	Set value description
bPS (BPS)	1200	1200bps
	2400	2400bps
	4800	4800bps
	9600	9600bps
	19. 2K	19200bps

The setting of the baud rate is a function to set the communication speed for RS-485 communications.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

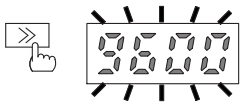
B. Press the ⏎ key several times to display the parameter “ANOu”.
Set the password “0169” for the parameter “ANOu” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⏎ key several times to display the parameter “bPS”.

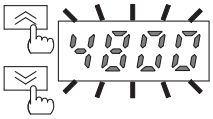
D. Press the ⏭ key to display the set value.

- The set value for the baud rate will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ≪ and ≪ keys.

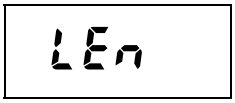
G. Press the ↵ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "LEn" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.34 Setting of Data Length



This sets the data length for serial communications.

Parameter	Set value	Set value description
LEn (LEN)	7	7bit
	8	8bit

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicator will be lit.
- The parameter will be displayed.

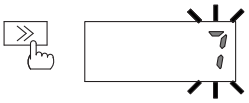
B. Press the ⏎ key several times to display the parameter "ADJ".
Set the password "0169" for the parameter "ADJ" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ⏎ key several times to display the parameter "LEn".

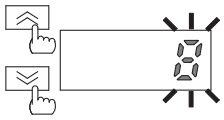
D. Press the ≫ key to display the set value.

- The set value for the data length will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ and ⩔ keys.

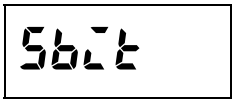
G. Press the ⮌ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "SEt" will be displayed.

H. Press the ▭ key for at least one second to return to ADJ Mode.

I. Press the ▭ key for at least one second to return to RUN Mode.

5.35 Setting of Stop Bits



This sets the number of stop bits for serial communications.

Parameter	Set value	Set value description
SbIt (SBIT)	1	1bit
	2	2bit

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicator will be lit.
- The parameter will be displayed.

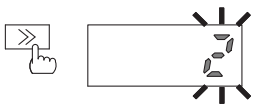
B. Press the ⏎ key several times to display the parameter "AnOu".
Set the password "0169" for the parameter "AnOu" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ⏎ key several times to display the parameter "SbIt".

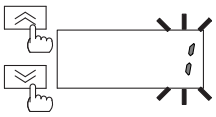
D. Press the ≫ key to display the set value.

- The set value for the stop bits will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ and ⩔ keys.

G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "Pr.t5" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.36 Setting of Parity Bit

PrtY

This sets the parity bit for serial communications.

Parameter	Set value	Set value description
PrtY (PRTY)	EVEN	Even parity
	ODD	Odd parity
	NONE	No parity

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The "RUN" indicator will be unlit and "ADJ" indicator will be lit.
- The parameter will be displayed.

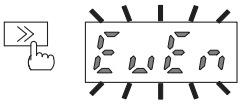
B. Press the ⏎ key several times to display the parameter "AnSu".
Set the password "0169" for the parameter "AnSu" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ⏎ key several times to display the parameter "PrtY".

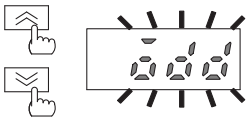
D. Press the ≫ key to display the set value.

- The set value for the parity bit will be displayed.

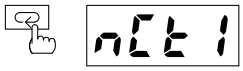


E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ and ⩔ keys.



G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "nCt 1" will be displayed for phase or cyclic control heaters and "OnHt" for ON/OFF control heaters.

H. Press the ▭ key for at least one second to return to ADJ Mode.

I. Press the ▭ key for at least one second to return to RUN Mode.

5.37 Setting of Gate OFF Alarm Output Hold Time
(Only for ON/OFF control type heaters ; K8AC-H2_ _C_)

This sets the burnout alarm output hold time.

Parameter	Set value	Set value description
GoHt (GOHT)	0 to 999	This function is used to set the output hold time period after the gate signal goes OFF until the burnout alarm output turns OFF. 0 to 999 : 0 sec to 999 sec Initial value = 2 sec

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

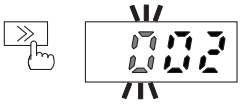
B. Press the ⊡ key several times to display the parameter “Adju”.
Set the password “0169” for the parameter “Adju” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ⊡ key several times to display the parameter “GoHt”.

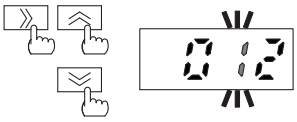
D. Press the ⊠ key to display the set value.

- The set value for the alarm output hold time will be displayed.



E. Press the ⊠ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓ , ⩔ and ⩕ keys.

G. Press the ⏎ key to switch to the next parameter.

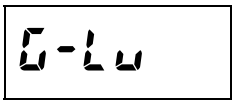
- The set value changed will be registered to the internal memory and "nCt 1" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.38 Setting of Operation Gate Current Level

(Only for phase or cyclic control type heaters: K8AC-H2_ _P_)



This sets the gate current value for stopping an alarm or detection.

Parameter	Set value	Set value description
G-Lv (G-LV)	7.0 to 20.0	If the gate current value falls below the set value, detection will be disabled. 7.0 to 20.0: 7.0mA to 20.0mA Initial value = 7.0mA

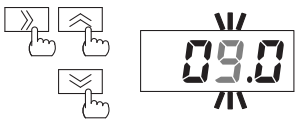
Operation procedure

A. Press the ⊻ key for at least one second during RUN Mode to change to the GATE Mode.

B. Press the ≫ key to display the set value.

C. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



D. The set value can be changed by the ⩓, ⊻ and ≫ keys.

E. Press the ↩ key to finalize it.

- The set value changed will be registered to the internal memory and "G-Lv" will be displayed.

F. Press the ⊻ key for at least one second to return to RUN Mode.

Memo
∗1. Even during this setting, alarm detection, output relay/output transistor and indicator display are available.
∗2. During this setting, the ADJ indicator will flash.

Teaching at the Operation Gate Current Level

The teaching function allows the setting with real inputs.

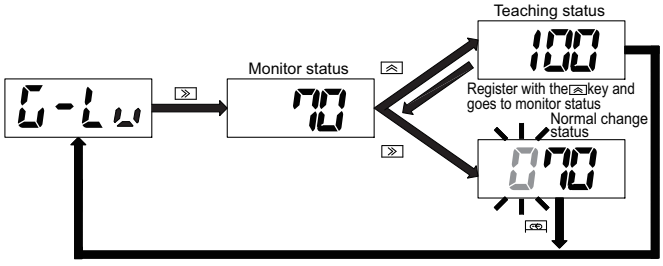
Operation procedure

G. The operation in C will bring you to the monitor status. Press the ⩓ key in the monitor status instead of the operation in D.

- You will enter the teaching status where the gate inputs change the set value accordingly.

H. Press the ⩓ key again.

- The input value will be registered as a set value and you will return to the monitor status.
- Pressing the ⩓ key in the teaching status instead of ↩ key will cancel the teaching.



5.39 Setting of Number of CT Passes

nCt *

This sets the number of CT passes and displays the current value in a prescale display.
The number of CT passes can be set for CT1 and CT2 individually.

Parameter	Set value	Set value description
nCt1 (NCT1)	01 to 99	The number of conductors that pass through CT1 can be set.
nCt2 (NCT2)	01 to 99	The number of conductors that pass through CT2 can be set.

*1. By setting the number of conductors that pass through the special CT (K8AC-CT_ _), the current per conductor can be displayed.
*2. This parameter setting affects the current display range, alarm hysteresis, burnout alarm set value and heater layer short circuit alarm level.
*3. When changing this parameter, the maximum/minimum heater current, measurement value at alarm output, burnout alarm set value, alarm hysteresis and heater layer short circuit alarm level will be reset.
However, the burnout alarm value and the heater layer short circuit alarm level will be reset to the value obtained from the following formula. (Maximum 9999 digits)
Reset value = initial value x CT ratio/number of CT passes

Operation procedure

three sec min. AL-1

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

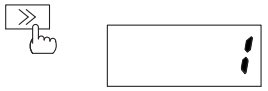
AAdu

B. Press the ⊡ key several times to display the parameter “AAdu”.
Set the password “0169” for the parameter “AAdu” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

nCt1

C. Press the ⊡ key several times to display the parameter “nCt1”.



D. Press the ≫ key to display the set value.

- The set value for the number of CT passes 1 will be displayed.

E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.

F. The set value can be changed by the ≪ , ≪ and ≫ keys.

G. Press the ↵ key to switch to the next parameter.

- After changing the setting and pressing the ↵ key, the next parameter "Ctr 1" will be displayed.

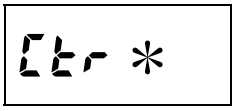
H. Repeat C. to G. to set "nCt2".

- After changing the setting and pressing the ↵ key, the next parameter "Ctr2". will be displayed.

I. Press the □ key for at least one second to return to ADJ Mode.

J. Press the □ key for at least one second to return to RUN Mode.

5.40 Setting of CT Ratio



This sets the CT ratio and displays the current value in a prescale display.
The CT ratio can be set for CT1 and CT2 individually.

Parameter	Set value	Set value description
Ctr 1 (CTR1)	001 to 999	The ratio between the primary side and secondary side of CT1 can be set.
Ctr2 (CTR2)	001 to 999	The ratio between the primary side and secondary side of CT2 can be set.

∗1. When installing a general-purpose CT at the primary side of the special CT (K8AC-CT_ _), the current value at the primary side of the general-purpose CT can be displayed by setting X (where the CT ratio for the CT is 1/X).
∗2. If this parameter setting goes beyond the range (exceeding 9999 digits), the setting in “5-41 Setting for Number of Effective Digits to be Displayed after the Decimal Point” can extend the display range.
∗3. This parameter setting affects the current display range, alarm hysteresis, burnout alarm set value and heater layer short circuit alarm level.
∗4. When changing this parameter, the maximum/minimum heater current, process value at alarm output, burnout alarm set value, alarm hysteresis and heater layer short circuit alarm level will be reset.
However, the burnout alarm value and the heater layer short circuit alarm level will be reset to the value obtained from the following formula.
(Maximum 9999 digits)
Reset value = initial value x CT ratio/number of CT passes

Operation procedure

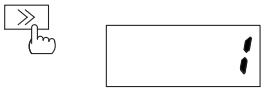
A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press the ⊏ key several times to display the parameter “Adju”.
Set the password “0169” for the parameter “Adju” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ↵ key several times to display the parameter "Ctr 1".



D. Press the » key to display the set value.

- The set value for the CT ratio 1 will bedisplayed.

E. Press the » key again.

- The status will enter the change status and the set value will start to flash.

F. The set value can be changed by the ^ , v and » keys.

G. Press the ↵ key to switch to the next parameter.

- After changing the setting and pressing the ↵ key, the next parameter "nd P 1" will be displayed.

H. Repeat C. to G. to set "Ctr2".

- After changing the setting and pressing the ↵ key, the next parameter "nd P2" will be displayed.

I. Press the □ key for at least one second to return to ADJ Mode.

J. Press the □ key for at least one second to return to RUN Mode.

5.41 Setting of Number of Effective Digits to be Displayed after the Decimal Point

This sets the number of effective digits to be displayed after the decimal point and displays the current value in a prescale display. The number of effective digits to be displayed after the decimal point can be set for CT1 and CT2 individually.

Parameter	Set value	Set value description
nDP1 (NDP1)	0 to 3 ∗1	The number of effective digits to be displayed after the decimal point for the CT1 current display can be set.
nDP2 (NDP2)	0 to 3 ∗1	The number of effective digits to be displayed after the decimal point for the CT2 current display can be set.

∗1. The setting range varies depending on the model.
K8AC-H21_ _-FLK : *000/0*00/00*0/0000.
K8AC-H22_ _-FLK : 0*00/00*0/0000.
K8AC-H23_ _-FLK : 00*0/0000.

∗2. In this parameter, selecting the decimal point position can set the effective digits and change the display range.
The digits outside the display range will be rounded off.
Ex.) For K8AC-H21_ _-FLK
NDP1=*000. Display 1.459
NDP1=0*00. Display 1.45
NDP1=00*0 Display 1.4
NDP1=0000. Display 1

∗3. This parameter setting affects the current display range, alarm hysteresis, burnout alarm set value and heater layer short circuit alarm level.

∗4. When changing this parameter, the maximum/minimum heater current, process value at alarm output, burnout alarm set value, alarm hysteresis and heater layer short circuit alarm level will be reset.
However, the burnout alarm value and the heater layer short circuit alarm level will be reset to the value obtained from the following formula. (Maximum 9999 digits)
Reset value = initial value x CT ratio/number of CT passes

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

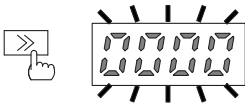
B. Press the ↵ key several times to display the parameter "Ano".
Set the password "0169" for the parameter "Ano" to move to SET Mode. For details, please see "5.2 Moving between Modes".

- The "ADJ" indicator will be unlit and "SET" indicator will be lit.

C. Press the ↵ key several times to display the parameter "ndP1".

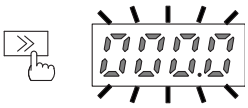
D. Press the » key to display the set value.

- The set value for the setting 1 for number of effective digits to be displayed after the decimal point will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ∧ , ∨ and » keys.

G. Press the ↵ key to switch to the next parameter.

- After changing the setting and pressing the ↵ key, the next parameter "nCt2" will be displayed.

H. Repeat C. to G. to set "ndP2".

- After changing the setting and pressing the ↵ key, the next parameter "SdLY" will be displayed.

I. Press the □ key for at least one second to return to ADJ Mode.

J. Press the □ key for at least one second to return to RUN Mode.

5.42 Setting SSR ON Delay

SdLY

Use this function to set the SSR ON delay.

Parameter	Set value	Set value description
SdLY (SDLY)	0.0 (OFF) to 99.9	SSR ON delay 0.0 (=OFF): Disable SSR ON delay 0.1 to 99.9: 0.1 to 99.9 sec.

The SSR ON delay function adjusts the time after detecting an SSR open (SSR burnout) or SSR short (SSR shortcircuit) to the alarm output.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

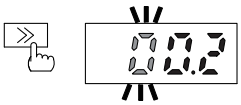
B. Press then key several times to display the parameter “AAdJ” .
Set the password “0169” for the parameter “AAdJ” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the key several times to display the parameter “SdLY” .

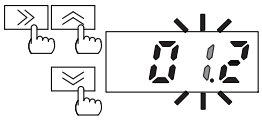
D. Press the » key to display the set value.

- The SSR ON delay will be displayed.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓, ⩔ and ⩕ keys.

G. Press the ⏎ key to move to the next parameter.

- The changed set value is registered to the internal memory and "SGLu" is displayed.

H. Press the ☐ key for at least one second to return to ADJ Mode.

I. Press the ☐ key for at least one second to return to RUN Mode.

5.43 Setting SSR Operation Gate Current Level
(Only for phase or cyclic control type heaters: K8AC-H2_ _P_)

Use this function to set the gate current level to disable the SSR open and SSR short alarm judgments.

Parameter	Set value	Set value description
SGLv (SGLV)	4.0 to 20.0	SSR open and SSR short alarm judgments are not available if the gate current level reaches below the set value. 4.0 to 20.0: 4.0 mA to 20.0 mA; initial value: 7.0 mA

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

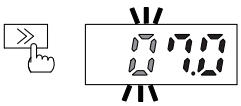
- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

B. Press then↵ key several times to display the parameter “ADBv” .
Set the password “0169” for the parameter “ADBv” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

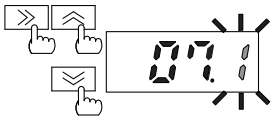
C. Press the ↵ key several times to display the parameter “SGLv” .

D. Press the » key to display the set value.



E. Press the » key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓, ⩔ and ⩕ keys.

G. Press the ⏎ key to move to the next parameter.

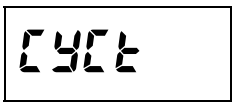
- The changed set value is registered to the internal memory and "CYCt" is displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

5.44 Setting Cycle Time

(Only for cyclic control type heaters: K8AC-H2_ _P_)



Use this function to set the cycle time.

Parameter	Set value	Set value description
CYCT (CYCT)	0.2 to 3.0	Cycle time 0.2 to 3.0: 0.2 to 3.0 sec.

Set the cycle time to a value matching to that of the power regulator.

Operation procedure

A. Press the □ key for at least three seconds during RUN Mode to change to ADJ Mode.

- The “RUN” indicator will be unlit and “ADJ” indicator will be lit.
- The parameter will be displayed.

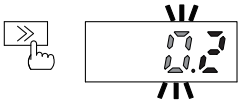
B. Press then↩ key several times to display the parameter “ADJU” .
Set the password “0169” for the parameter “ADJU” to move to SET Mode. For details, please see “5.2 Moving between Modes”.

- The “ADJ” indicator will be unlit and “SET” indicator will be lit.

C. Press the ↩ key several times to display the parameter “CYCT” .

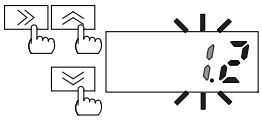
D. Press the ≫ key to display the set value.

- The cycle time setting will be displayed.



E. Press the ≫ key again.

- The status will enter the change status and the set value will start to flash.



F. The set value can be changed by the ⩓, ⩔ and ⩕ keys.

G. Press the ⏎ key to switch to the next parameter.

- The set value changed will be registered to the internal memory and "EndE" will be displayed.

H. Press the □ key for at least one second to return to ADJ Mode.

I. Press the □ key for at least one second to return to RUN Mode.

J. Restart the unit.

The unit reflects the set value after restart.

Section 6 Serial Communications Function

This Section describes command responses that comply with the CompoWay/F communication protocol and operation procedures from a host computer via communication.

6.1 Communications Method 6-2
6.2 Frames 6-4
6.3 FINS-mini Text 6-7
6.4 Variable Areas 6-9
6.5 Reading the Variable Area 6-10
6.6 Writing to the Variable Area 6-12
6.7 Operation Commands 6-14
6.8 Setting Areas 6-16
6.9 Commands and Responses 6-17
6.10 Variable Area Map 6-21
6.11 Program Examples 6-23

6.1 Communications Method

■ CompoWay / F Communications Protocol

CompoWay/F is OMRON's unified protocol for general purpose serial communications. Featuring a unified frame format and commands that are compliant with FINS, which has a record of successful use with OMRON programmable controllers, CompoWay/F makes communications easy between multiple components and a computer.

FINS (Factory Interface Network Service)
This is a protocol for message communications between controllers on an OMRON factory automation network.

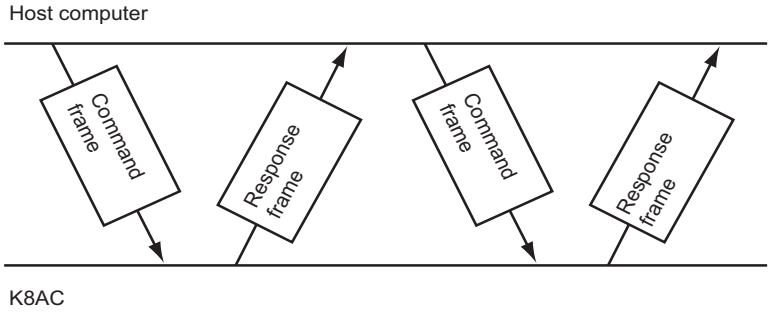
Note: The communications function is used by creating a program on the host computer. As such, the explanations in this chapter are from the perspective of the host computer. For example, "Read/Write" refers to the host computer reading or writing to the K8AC.

■ Communications Specifications

Transfer connection:	Point-to-point
Communications method:	RS-485
Synchronization method:	Start-stop synchronization
Transmission speed:	1200, 2400, 4800, 9600, 19200 bps
Send code:	ASCII
Data length:	7/8 bits
Stop bit length:	1/2 bits
Error detection:	Vertical parity (None/Even/Odd)
	BCC (Block Check Character)
	Start-stop synchronization data configuration
Flow control:	None
Interface:	RS-485
Retry function:	None

■ Transfer Protocol

The host computer sends a command frame and the K8AC sends back a response frame based on the content of the command frame. A single response frame is returned for each command frame. The following diagram shows the transfer of command and response frames.

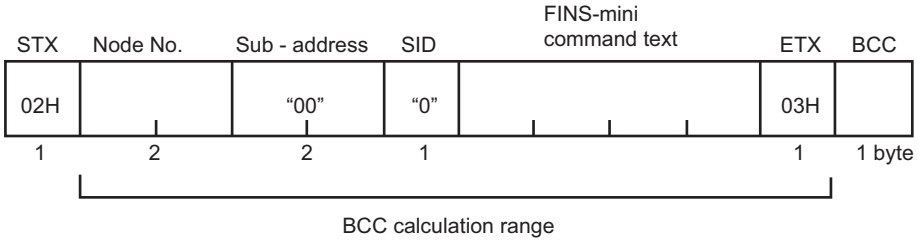

Host computer
Command frame
Response frame
Command frame
Response frame
K8AC

6.2 Frames

Based on CompoWay/F protocol, commands from the host computer and responses from the K8AC take the from of frames. The data comprising command frames and response frames are explained below.

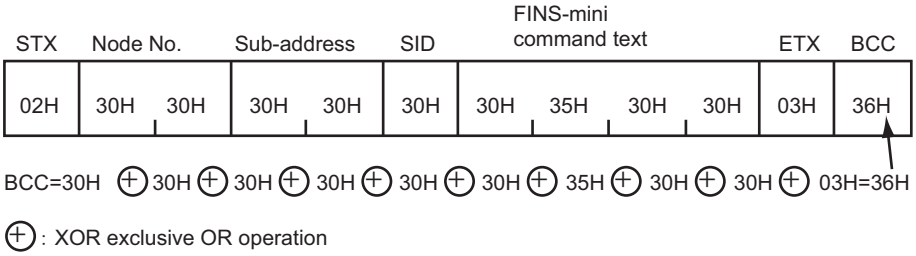
In the following explanation, an "H" following a numeric value (for example 02H) indicates that the value is a hexadecimal number. A numbers or letters enclosed in quotation marks (for example "00") is an ASCII characters.

■ Command Frame

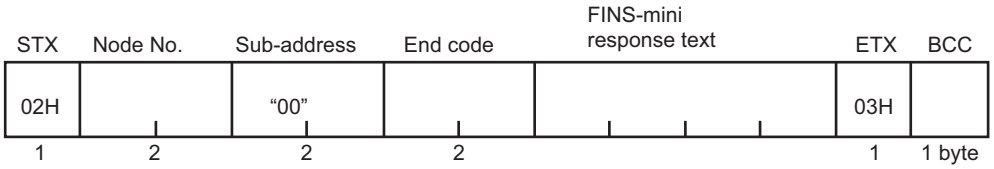


STX	Code that indicates the beginning of the communications frame (02H). Be sure to set this code in the first byte.
Node No.	This number specifies the destination. Specify the Unit No.of the K8AC.
Sub-address	Not used for K8AC. Be sure to set to "00".
SID (service ID)	Not used for K8AC. Be sure to set to "0".
FINS-mini Command text	The body of the command.
ETX	Code that indicates the end of text (03H).
BCC	Block Check Character. This stores the result of the BCC calculation from Node No. to ETX.

Note : How to calculate BCC: The calculation result of exclusive OR of the data from the BCC node number to ETX will be set as BCC.



■ Response Frame



Note: It does not respond to the command frame that has not completed ETX and BCC character.

STX	Code that indicates the beginning of the communications frame (02H).
Node No.	The number that was specified in the command frame is repeated here. This is the Unit No.of the responding K8AC.
Sub address	Not used for K8AC. Set to “00”.
End code	Returns the result of the command executed as instructed by the command frame.
FINS-mini response text	Text of the response
ETX	Code that indicates the end of text (03H).
BCC	Block Check Character. Stores the result of the BCC calculation from Node No. to ETX.

● End code

End code	Name	Description
"OF"	FINS command error	Could not execute the specified FINS command.
"10"	Parity error	Sum of bits that are “1” in received date dose not agree with the set communuca-tions parity value.
"11"	Framing error	Stop bit of command frame characters is “0”.
"12"	Overrun error	Attemted to transfer new data because received date buffer is already full.
"13"	BCC error	Calculated BCC different from received BCC.
"14"	Format error	Characters other than “0” to ”9” or ”A“ to ”F” in FINS-mini command text. In the case of an echo-back test, when date other than the test date is sent. No SID and FINS-mini command text, or no FINS-mini command text. “MRC/SRC” not correct in FINS-mini command text.

"16"	Sub-address error	No sub-address, SID, or FINS-mini command text; or sub-address less than 2 characters and no SID and FINS-mini command text.
"18"	Frame length error	The received frame exceeds the required number of bytes.
"00"	Normal end	Command was executed normallr without error.

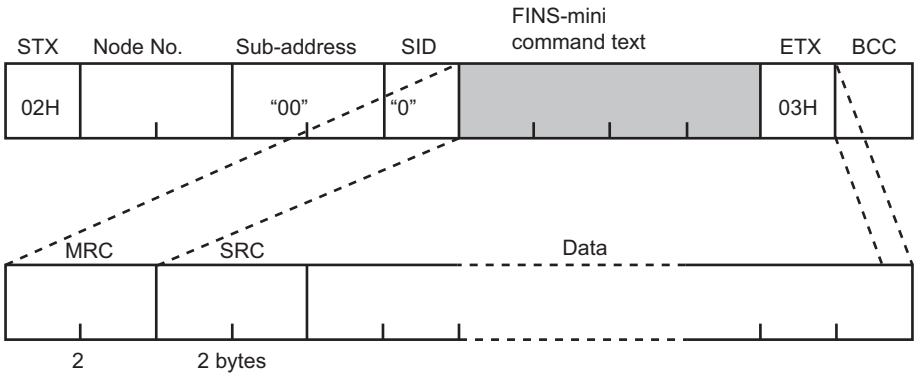
6.3 FINS-mini Text

The FINS-mini command text and FINS-mini response text form the body of command/ response communications.

FINS-mini command text and FINS-mini response text are configured as follows.

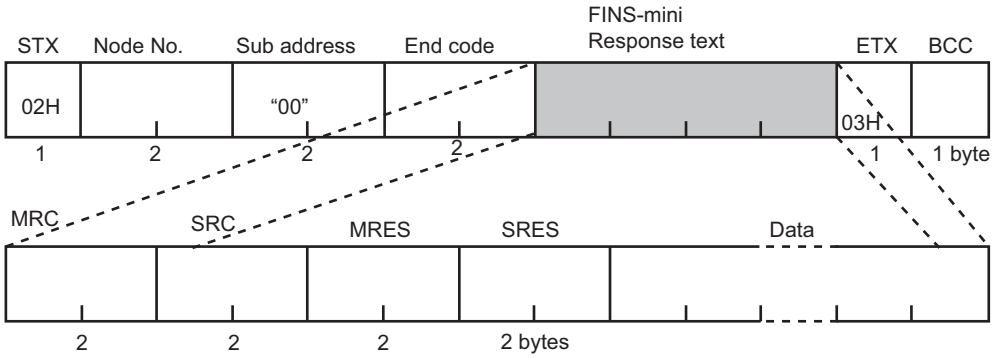
■ Command Text

FINS-mini command text consists of an MRC (main request code) and an SRC (sub request code), followed by the required data.



■ Response Text

FINS-mini response text consists of the MRC and SRC, followed by an MRES (main response code) and SRES (sub-response code), and then the required data.



If the specified FINS-mini command was not successfully executed, the response will only contain the MRC, SRC, MRES and SRES.

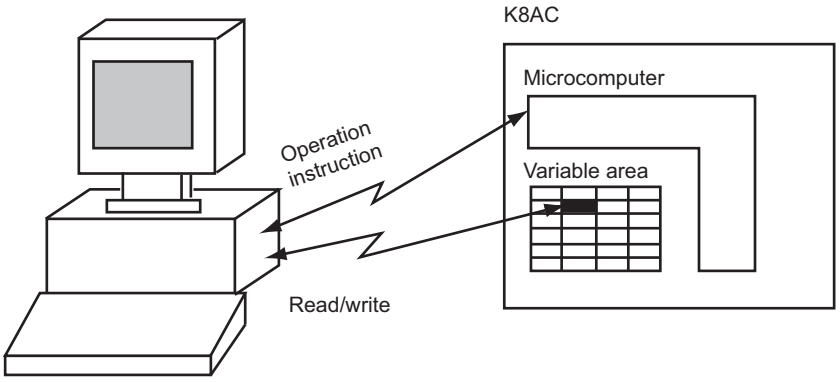
■ List of FINS-mini Service Commands

MRC	SRC	Service name	Description
"01"	"01"	Measurement value read	Reads measurement value date.

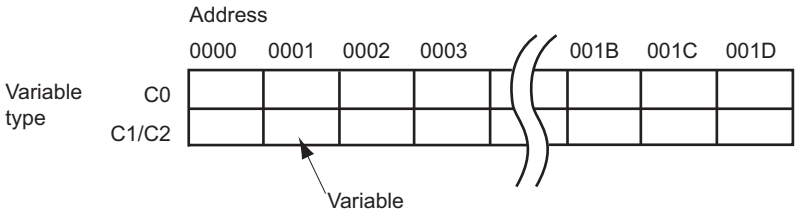
"01"	"02"	Set value write	Writes set value date.
"05"	"03"	Machine attribute read	Reads the model and other attributes.
"06"	"01"	Controller status read	Reads the operation status
"08"	"01"	Echo-back test	Performs an echo-back test.
"30"	"05"	Operation command	Commands such as Run/Stop, AT Execute/Cancel, and “Move to setting area 1”.

6.4 Variable Areas

The area used for data exchange when communicating with the K8AC is called the "variable area. "The PV is read and various setting data are read and written using the variable area of K8AC.
Operation commands and reding of machine attributes do not use the variable area.



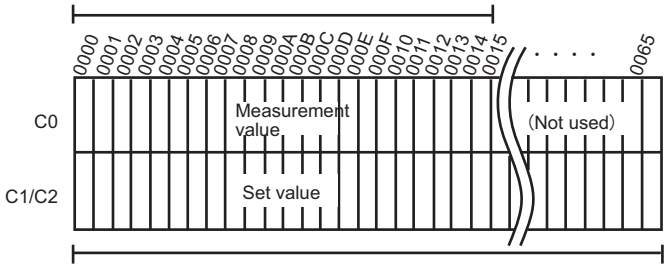
A variable area is accessed by specifying the position of a variable within the variable area using the variable type and address.



The address is expressed in 4-digit hexadecimal format.

The variable is an 8-digit numerical value in hexadecimal format. The decimal point is removed and the result is converted to hexadecimal. For example, when the load current value for the K8AC is shown as "10. 5" in the 7-digit display, the load current will be readas 00000069H (10.5 → 105 → 00000069H).

The K8AC uses the variable area as follows.

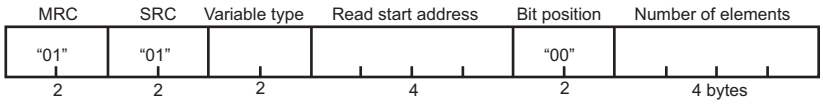


Variable type C0: Read-only parameters for the measurement value (load current, trip count, etc.)
Variable type C1: ADJ Mode
Variable type C2: SET Mode

6.5 Reading the Variable Area

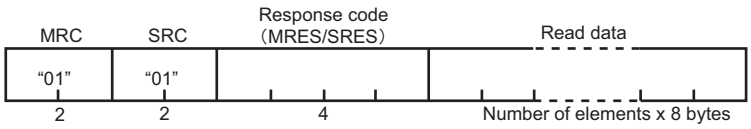
The date area is read by setting the required data to the following FINS-mini command text format.

Command FINS-mini command text



Data name	Description
MRC/SRC	The FINS-mini command text appears hear.
Variable type	For K8AC, specify either “C0”, ”C1” or “C2”.
Read start address	Specify the address for the beginning of the read.
Bit position	Not used for K8AC. Specify “00”.
Number of elements	The number of elements is limited to 1 for K8AC. Specify “0001”.

Response FINS-mini response text



Data name	Description
MRC/SRC	The FINS-mini command text appears here.
Response code	Result of execution of the command.
Read data	Value for variables that were read.

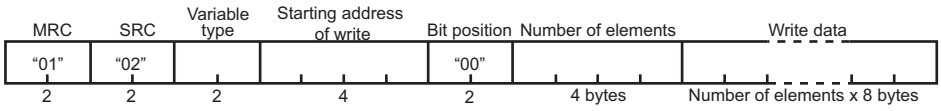
Response codes

Response code	Error name	Description
"1001"	Long command length	Command length is too long.
"1002"	Short command length	Command length is too short.
"1101"	Area type error	Variable type is wrong.
"1103"	Start address outside of range error	Read start address is out of range.
"110B"	Long response length	If the command is executed, the data amount of the response will exceed the transferable level.
"1100"	Parameter error	Specified bit position is other than “00”.
"2203"	Operation error	Internal nonvolatile memory error.
"0000"	Normal end	

6.6 Writing to the Variable Area

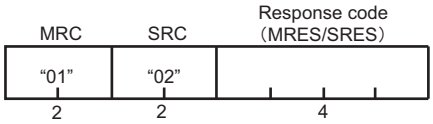
Write to the date area by setting the required data to the following FINS-mini command text format.

Command FINS-mini command text



Data name	Description
MRC/SRC	Specifies the write to the variable area for the FINS-mini command.
Variable type	For K8AC, specify either “C1” or ”C2”.
Read start address	Specifies the write start address.
Bit position	Not used for K8AC. Specify “00”.
Number of elements	The number of elements is limited to 1 for K8AC. Specify “0001”.
Write data	Enter date to be written.

Response FINS-mini response text



Data name	Description
MRC/SRC	FINS-mini command text appears here.
Response code	Result of execution of the command.

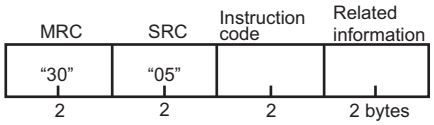
Response Code

Response Code	Error name	Description
"1002"	Short command length	Command length is too short.
"1101"	Area type error	Incorrect variable type.
"1103"	Start address outside of range error	Read start address is out of range.
"1104"	End address outside of range error	Read end address is out of range.
"1003"	Number of elements/Date number do not agree	The specified number of elements dose not agree with the actual number of date elements.
"1100"	Parameter error	Bit position specification other than “00”. Written data is outside of setting range.
"3003"	Read only	Data was written to the variable type “C0”.
"2203"	Operation error	Write via communications is disabled. Internal nonvolatile memory error.
"0000"	Normal end	

6.7 Operation Commands

Operation commands are sent using the following FINS-mini command text format.

Command FINS-mini command text

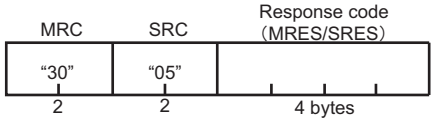


Data name	Explanation
MRC/SRC	Specifiy the FINS-mini operation command.
Operation code	Specifiy an operation code.
Related information	Specifiy information related to the command.

Operation for the K8AC are as follows.

Code	Related information	Description
00	00	Switching to RUN Mode
	01	Switching to SET Mode
01	00	Initialization of all settings

Response FINS-mini response text



Data name	Description
MRC/SRC	FINS-mini command text appears here.
Response code	Result of execution of the command.

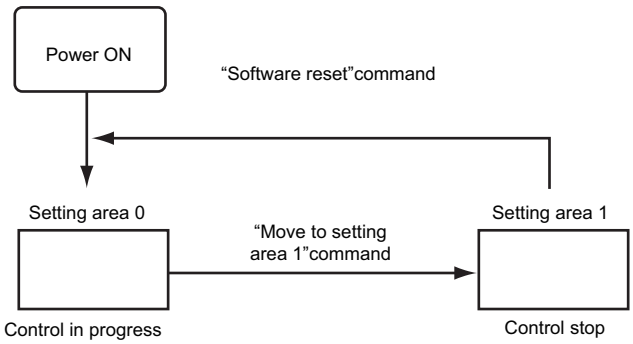
Response Code

Response Code	Error name	Description
"1001"	Long command length	Command length is too long.
"1002"	Short command length	Command length is too short.
"1100"	Parameter error	Operation code or related information is not correct.
"2203"	Opration error	Unable to execute because write via communications is disabled.Unable to execute operation command.
"0000"	Normal end	

6.8 Setting Areas

Measurement is stopped in the SET Mode.Write-in of the setting parameter can be performed, while it is impossible in RUN Mode.

When the power is turned on, Run mode is selected. To access setting mode, use the “Move to setting mode” operation command. To return to setting mode from Run mode, turn off the power or use the “Software reset” operation command.



6.9 Commands and Responses

The K8AC provides a set of applied commands that make use of variable area read/write commands, operation commands, and other services provided by the CompoWay/F communications protocol.

K8AC applied commands are explained below.

■ Measurement value read

Command

MRC	SRC	Variable type	Address	Bit position	Number of elements
"01"	"01"	"C0"	"＊＊＊＊"	"00"	"0001"

Reads the present value.

This command is used in RUN Mode. (When used in SET Mode, the present value data for the response is unstable.) For details on the addresses, please see "6.10 Variable Area Map/List of Addresses".

Response

MRC	SRC	Response code	Data
"01"	"01"	"0000"	Present value

Response code: The above indicates a normal end situation. For details on the response codes, please see "6.5 Reading the Variable Area". (page 6-10)

■ Set value write

Command

MRC	SRC	Variable type	Address	Bit position	Number of elements	Data
"01"	"02"	"C1"		"00"	"0001"	

Parameters for the basic setting/extended setting are written (excluding setting items related to serial communications). For how to specify the address, please see "6.10 Variable Area Map". RUN Mode SW is enabled. If used in RUN Mode, an error will occur.

Before issuing a command, the mode must be changed to SET Mode using the operation command.

Response

MRC	SRC	Response code
"01"	"02"	"0000"

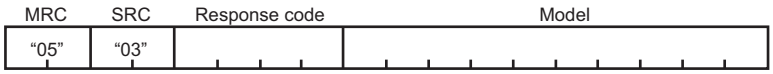
Response code: The above description is about the normal completion situation. For details on the response codes, please see "6.6 Writing to the Variable Area". (page 6-12).

■ Read Machine Attributes

Command

This command reads the K8AC model and communications buffer size.
Thiscommand is available both in RUN Mode and SET Mode

Response



This is expressed in the ten-byte format. If less than ten bytes, the remaining portions will be filled with spaces. As a buffer size, the fixed value of 0068H bytes (104 bytes) will be returned.

Response code

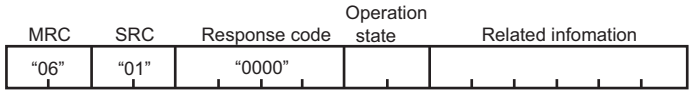
Response code	Error name	Description
"1001"	Long command length	Command length is too long
"2203"	Operation error	Internal nonvolatile memory error
"0000"	Normal end	

■ Controller Status Read

Command

This command reads the K8AC model and communications buffer size.
The commannd can be used in any state of the K8AC.

Response



Response code: The above indicates a normal end. For the response codes, please see
“ 6.5 Reading the Variable Area“. (page 6-10)

Operation State

Operation state	Description
00	Operating (no errors in setting area 0, see note)
01	Stopped (all other situations)

Note: Measurements outside the display range and no-measurement status do not generate errors and thus may be possible even for operation state of 00.

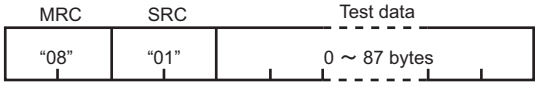
Related Information

Bit position	Status	
7	Not used	
6	Not used	
5	Not used	
4	Not used	
3	Input error B	Present value
2	Input error A	
1	Measurement outside the display range	
0	No-measurement status	

Note: 1. The bit will be ON (1) or when an error occurs and otherwise will be OFF (0).
2. Information is in the same order as status information.

■ Echo Back Test

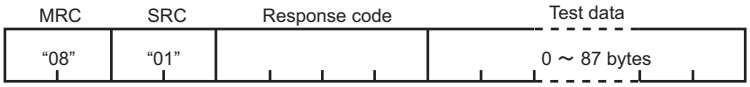
Command



This command is used to perfom an echo back test. This command is available both in RUN Mode and SET Mode.
Keep the test data within the following ranges depending on the communications data length.

Communications data length	Description
7 bits	ASCII code 20H to 70H
8 bits	ASCII code 20H to 7EH or A1H to FEH

Response



Response code

Response code	Error name	Description
"1001"	Long command length	Command length is too long.
"2203"	Operation error	Internal nonvolatile memory error
"0000"	Normal end	

6.10 Variable Area Map

In K8AC, the variable area is used as follows.

Variable type C0: Read-only parameters for the measurement values.

Variable type C1: ADJ Mode

Variable type C2: SET Mode

Variable type	Address	Parameter name	Setting range	Remarks
C0	0000	Heater 1 current value		Read only
	0001	Heater 2 current value		Read only
	0002	Power supply voltage		Read only
	0003	Heater 1 maximum current value		Read only
	0004	Heater 1 minimum current value		Read only
	0005	Heater 2 maximum current value		Read only
	0006	Heater 2 minimum current value		Read only
	0007	Maximum power supply voltage value		Read only
	0008	Minimum power supply voltage value		Read only
	0009	Number of alarm outputs		Read only
	000A	Processing value at alarm output		Read only
	000B	Run time		Read only
C1	0000	Burnout alarm set value 1	H21,22: C8 to 898 H23: C8 to7D0	*1
	0001	Burnout alarm set value 2	H21,22: C8 to 898 H23: C8 to7D0	*1
	0002	Voltage fluctuation compensation function	64 to F0	100 to 240V

Note1: When using the scaling function, the setting range varies depending on the CT ratio, the number CT passes and setting for the number of effective digits to be displayed after the decimal point.

Minimum set value = minimum value within the range x CT ratio / number of CT passes

Maximum set value = maximum value within the range x CT ratio / number of CT passes (AL-1 is affected by the CT ratio 1, the number of CT passes 1 and the setting 1 for number of effective digits to be displayed after the decimal point.

AL-2 is affected by the CT ratio 2, the number of CT passes 2 and the setting 2 for number of effective digits to be displayed after the decimal point.)

C2	0000	Alarm hysteresis 1	1 to 3E7	1 to 999digit
	0001	Alarm hysteresis 2	1 to 3E7	1 to 999digit
	0002	Gate input function	0:ON 1:OFF	
	0003	Voltage fluctuation compensation function	0:ON 1:OFF	
	0004	Startup lock time	0 to FF	0 to 255s
	0005	Output ON-delay time	0 to 3E7	0 to 99.9s
	0006	Soft startup time	0 to 3E7	0 to 99.9s
	0007	SSR short circuit detection function	0:ON 1:OFF	
	0008	SSR open detection function	0:ON 1:OFF	
	0009	Heater layer short circuit detection function	0:ON 1:OFF	
	000A	Heater layer short circuit alarm level	H21,22: C8 to 898 H23: C8 to 7D0	*1
	000B	Heater control method	0:PH1 1:PH3 2:CYCL	
	000C	Continuously displayed measurement value	0:CT1 1:CT2	
	000D	Power save operation	0:ON 1:OFF	
	000E	Power save operation time	A to 12C	10 to 300s
	000F	Display method	0:NORM 1:CMP 2:BAR	
	0010	Display refresh	0:0.2s 1:0.5s 2:1.0s 3:FAST	
	0011	Gate OFF output hold time	0 to 3E7	0 to 999s
	0012	Number of CT passes 1	1 to 63	1 to 99
	0013	CT ratio 1	1 to 3E7	1 to 999
	0014	Setting 1 for number of effective digits to be displayed after the decimal point	0:0000. 1:000.0 2:00.00 3:0.000	

Note1: When using the scaling function, the setting range varies depending on the CT ratio, the number CT passes and setting for the number of effective digits to be displayed after the decimal point.

Minimum set value = minimum value within the range x CT ratio / number of CT passes

Maximum set value = maximum value within the range x CT ratio / number of CT passes

(AL-1 is affected by the CT ratio 1, the number of CT passes 1 and the setting 1 for number of effective digits to be displayed after the decimal poin. AL-2 is affected by the CT ratio 2, the number of CT passes 2 and the setting 2 for number of effective digits to be displayed after the decimal point.)

C2	0015	Number of CT passes 2	1 to 63	1 to 99
	0016	CT ratio 2	1 to 3E7	1 to 999
	0017	Setting 2 for number of effective digits to be displayed after the decimal point	0:0000. 1:000.0 2:00.00 3:0.000	
	0018	SSR ON delay	0 to 3E7	0 to 99.9s
	0019	SSR operation gate current level	28 to C8	4.0 to 20.0mA
	001A	Cycle time	2 to 1E	0.2 to 3.0s
	A000	Operation gate current level	46 to C8	7.0 to 20.0mA

6.11 Program Examples

■ Protocol Macro

What is the protocol macro function ?

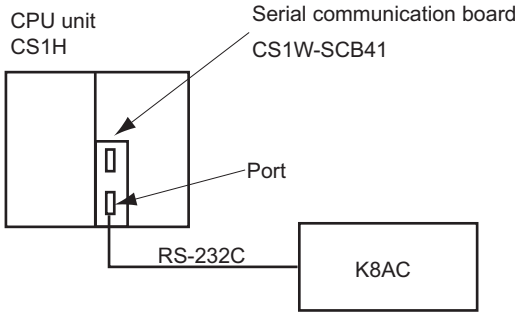
The protocol macro is a ladder routine that, using a PMCR command, provides control to the sequence (protocol) of data transmission between various communication devices such as generapurpose components connected via RS-232C or RS-422A/485 interface.

The serial communication board/unit comes standard with a standard system protocol that allows control of OMRON's components (regulator, temperature controller unit, etc).

For details on the protocol macro, please refer to the "Users Manual for CS1W-SCB21/41/ -SCU21" (Cat. No. SBCD-300C).

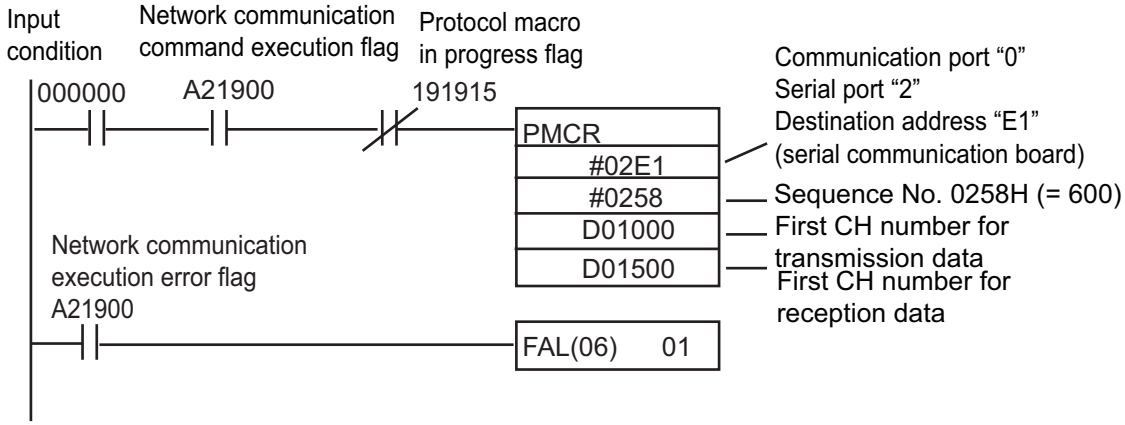
Connection

The port 2 of the serial communication board CS1W-SCB41 allows connection via RS -232C line.



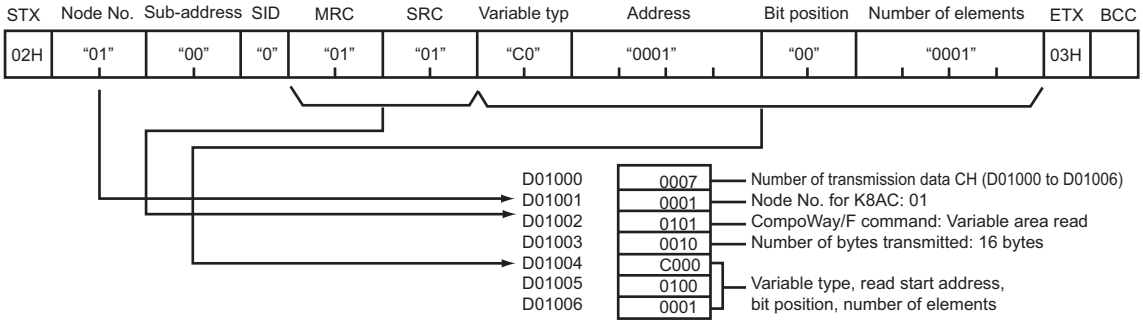
Example of ladder creation

The present value in K8AC is read through communications (with responses) with No. 600 ASCII conversion according to the standard system protocol “CompoWay/F for Master Station”, which is contained in the serial communication board.

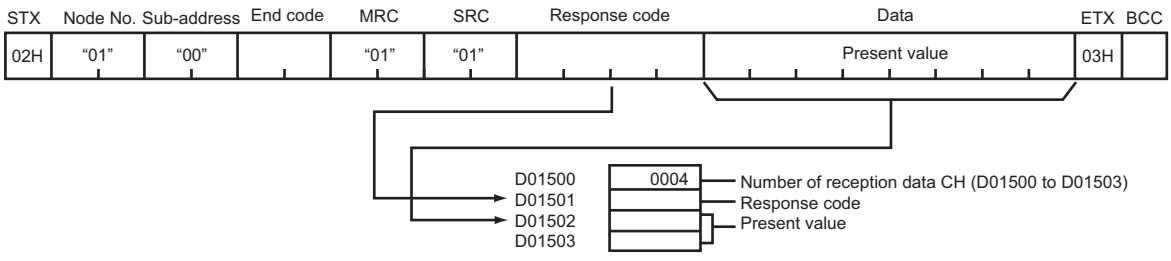


Placing the “read present value” command in D01000 or a higher-numbered location causes the present value to be stored in D0152 to D0153. If a communication error occurs, an FAL command (continuous operation failure diagnosis command) is executed.

- Transmission data channel assignment



- Reception data channel assignment



Section 7 Troubleshooting

This Section describes errors such as failure and their countermeasures as well as how to troubleshoot problems.

7.1 Error Display 7-2
7.2 Troubleshooting 7-3

7.1 Error Display

7-segment display	Error description	Countermeasure
Err	Internal memory error.	Repair is nesessary. Consult your OMRON representative.
EErr	Non-volatile memory error.	Repair is nesessary. Consult your OMRON representative.

7.2 Troubleshooting

Symptoms	Inspection details	Countermeasure	Reference page
Pressing the □ key for at least one second does not move to ADJ Mode.	Is the setting protection function disabled?	Disable the setting protection to "enable" changes.	5-25
Pressing the ≫ key during setting change does not change the parameter change status.	Is the setting change protection not enabled?	Disable the setting protection to "enable" changes.	5-25
Immediately after the power-on, a heater burnout alarm is not output.	• Is the heater burnout alarm value not too small? • Is the gate setting turned on? Or, is the gate input in accordance with the control specifications? • Is the standard value for voltage fluctuation compensation function consistent with the power supply voltage? • Is the set value for startup lock time not too large?	Set the set value for these parameters to an appropriate value.	5-27 5-40 5-42 5-44
Even when the heater current goes beyond the heater burnout alarm threshold value, a heater burnout alarm is not returned.	Is the set value for hysteresis not too large?	Set the set value for hysteresis to an appropriate value. The K8AC-H allows setting of the hysteresis per current input. Set these two inputs.	5-38
When only using a single CT, a heater burnout alarm is always output.	Is the “Burnout alarm set value” for an unused CT not set to other than “-”.	Set the set value for the unused CT input to “-”.	5-27

Symptoms	Inspection details	Countermeasure	Reference page
A heater burnout alarm is not output.	• Is the heater burnout alarm value not too small? • Is the gate setting turned on? Or, is the gate input in accordance with the control specifications? • Is the standard value for voltage fluctuation compensation function consistent with the power supply voltage? • Is the set value for startup lock time not too large?	When using the voltage fluctuation compensation function, match the power supply voltage with the set value.	5-27 5-40 5-42 5-44
Even when no burnout occurs, a burnout alarm is output.	• Is the difference between the normal current value and the burnout set value not too small? • In ON/OFF control, is ON time not set below 200ms?	Use the power supply voltage compensation function. Set the soft startup time to at least 0.2 seconds.	5-30 5-42 5-48
The current passing thought the special CT is significantly different from the displayed current value.	• Is the model or heater control method selected that is suitable for the heaterÅfs control method? • Is the scaling parameter not enabled? • Is an excessive input beyond the current input range not applied?	Select the model or heater control method that is suitable for the heaterÅfs control method. When displaying the current at the primary side of the special CT, set the scaling parameter to the initial value. The display may not be shown correctly if exceeding the input range. Make measurement within the input range.	5-56 5-85 5-87 5-89

Appendices

Specifications.....A-2
Parameter List A-6

Specifications

Ratings

Supply voltage	100 to 240VAC (50/60Hz)		
Operating voltage	85% to 110% of supply voltage (85 to 264V)		
Power consumption	35VA max (max. load)		
Insulation resistance	20 MΩ min (at 500V mega) between external terminals and case		
Dielectric strength	2,000V for 1 min between external terminals and case		
Noise immunity	±1,500 V on power supply terminals in normal or common mode (Pulse width 1 μ/100ns for square-wave noise with 1 ns rise time)		
Vibration resistance	Vibration: 10 to 55Hz, Acceleration: 50m/s2, X, Y and Z directions: 5 min x 10 wipes		
Shock resistance	150m/s2 (100m/s2 for relay contact) 3 times in 3 axes in 6 directions each		
Over load resistance	Primary side current for detection CT	K8AC-H21_ _	4A, 30s and 12A,1s
		K8AC-H22_ _	40A, 30s and 20A,1s
		K8AC-H23_ _	400A, 30 and 1200A,1s
	4 to 20mA gate input	Continuous load of DC40mA	
	Voltage pulse gate input	Continuous load of 30VDC	
Input impedance	4 to 20mA gate input	50Ω max.	
	Voltage pulse gate input	4kΩ min.	
Ambient temperature for use	-10 to 55℃(with no icing or condensation)		
Ambient humidity for use	25 to 85%RH		
Storage temperature	-25 to +65℃(with no icing or condensation)		
Storage humidity	25 to 85%RH		
Altitude	2000m max.		
External dimension	W35 × D90 × H100mm		
Case material	PC		
Exterior color	Body: N1.5 (clear black)		
Mounting method	Mounting to a DIN rail		
Weight	Approx. 200g		

Curent detection CT	K8AC-H21_ _	0.200 to 2.200A	K8AC-CT20S (ϕ 5.8) ∗ K8AC-CT20L (ϕ 12) ∗
	K8AC-H22_ _	2.00 to 22.00A	
	K8AC-H23_ _	20.0 to 200.0A	K8AC-CT200 (ϕ 12) ∗ K8AC-CT200L (ϕ 30) ∗

∗ Curent sensor is an optional.

Output ratings

Relay output	Rated load	Resistive load: 125VAC 0.3A, 30VDC 1A
	Max. value of contact voltage	125VAC, 60VDC
	Max. value of contact current	1A
	Max. value of switching capacity	37.5VA, 30W
	Minimum applicable load (P standard)	5VDC, 10mA (Reference value)
	Mechanical life	50,000,000 operations min. (at a switching frequency of 18,000 times / h)
	Electrical life (Ambient temperature condition: +20℃)	100,000 operations min. (with rated load, at a switching frequency of 1,800 times / h)
Transistor output	Rated voltage load	12 to 24VAC (+10%,-15%)
	Max. load current	50mA
	OFF leakage current	100 μ A max.
	ON residual voltage	1.5V max.

Characteristics

Output return method	Automatic return		
Hysteresis	1 to 999 digits		
Output response time	ON/OFF control type (K8AC-H2_C_)		500ms max.
	Phase or Cyclic control type (K8AC-H2_P_)		3.5s max.
Output type	Relay output (K8AC-H2_ _C)		1c contact 1 output
	Transistor output (K8AC-H2_ _N)		Two open collector 2 outputs
Measuring type	Root-mean-square value operation method by measurement at moment		
Heater current input (at 10 to 30℃) CAT II	Input range	K8AC-H21_ _	0.200 to 2.200A
		K8AC-H22_ _	2.00 to 22.00A
		K8AC-H23_ _	20.0 to 200.0A
	Measurement accuracy	K8AC-H2_C_ ±3% rdg ±10 digits *	
		K8AC-H2_P_ ±6% rdg ±10 digits *	
Voltage fluctuation compensation CAT II	Input range	85 to 264VAC	
	Measuring accuracy	Max, ±3% rdg ±10 digits	
Gate input	Input range for K8AC-H2_P_	4 to 20mA DC	
	Input range for K8AC-H2_C_	0 to12 VDC or 0 to 24 VDC ON level: 9.6 VDC max. OFF level: 1 VDC min.	
Specification Communications	Baud rate	1200, 2400, 4800, 9600, 19200bps	
	Connection type	Multi-point	
	Error detection	Parity check	
	Communication method	RS-485 compliant	
	Communication protocol	Compoway / F	
Display refresh	Serection of Fast- 0.2sec- 0.5sec - 1.0sec		
Memory protection	Non-volatile memory (possible to rewrire: 100,000 times)		

* The measurement accuracy is a guaranteed value when you use a current CT, whitch is exclusively desigated for K8AC-H.

Applicable standards

Installation environment	Overvoltage Category 2, Pollution Class 2	
Safety Standard	UL61010-1, CAN / CSA C22.2 No.61010-1-04 EN61010-1 (IEC61010-1) (Evaluated by TUV)	
EMC	EMI: EN61326 industrial applications	
	Electromagnetic radiation interference EN 55011 Group1, Class A: Terminal interference voltage EN 55011 Group1, Class A:	
	EMS: EN61326 industrial applications	
	Electrostatic Discharge Immunity	EN61000-4-2: 4kV (contact), 8kV (in air)
	Radiated Electomagnetic Field Immunity	EN61000-4-3: 10V/m 1kHz sine wave amplitude modulation (80 MHz to 1GHz)
	Erectrical Fast Transient/ Burst Immunity	EN61000-4-4: 2kV (power line), 1kV (I / O signal line)
	Surge immunity	EN61000-4-5: 1 kV with line (power line), 2 kV with grpund (power line)
	Conducted Disturbance Immunity	EN61000-4-6: 3V (0.15 to 80 MHz)
	Voltage Dips and Interruptions Immunity	EN61000-4-11: 0.5 cycle, 0° /180° ,100% (rated voltage)

Parameter List

Enter the set values before using.

Mode	Parameter name	Parameter	Setting range	Initial value	Unit	Set value
Protect	Setting change protect	ASPt	0 to 2	0		
		VtPt	OFF/ON	OFF		
ADJ	Burnout alarm value setting 1	AL-1	Varies depending on the model. K8AC-H21_ _ 0.200 to 2.200 K8AC-H22_ _ 2.00 to 22.00 K8AC-H23_ _ 20.0 to 200.0	The initial value varies depending on the model. ∗3 K8AC-H21_ _ 1.000A K8AC-H22_ _ 10.00A K8AC-H23_ _ 100.0A	A	
	Burnout alarm value setting 2	AL-2	Varies depending on the model. K8AC-H21_ _ 0.200 to 2.200 K8AC-H22_ _ 2.00 to 22.00 K8AC-H23_ _ 20.0 to 200.0	The initial value varies depending on the model. ∗3 K8AC-H21_ _ 1.000A K8AC-H22_ _ 10.00A K8AC-H23_ _ 100.0A	A	
	Voltage fluctuation compensation standard value	uFCu	100 to 240	100	V	

Please refer to the next page for SET Mode.

Mode	Parameter name	Parameter	Setting range	Initial value	unit	Set value
SET	All initialization	InIt	OFF/ON	OFF		
	Set value initialization	SInI	OFF/ON	OFF		
	Measurement value initialization	PInI	OFF/ON	OFF		
	Alarm hysteresis 1	HYS 1	1 to 999	10		
	Alarm hysteresis 2	HYS 2	1 to 999	10		
	Gate input function	GAtE	OFF/ON	ON		
	Voltage fluctuation compensation function	CoMP	OFF/ON	OFF		
	Startup lock time	StLn	0 (OFF) to 255s	0	s	
	Output ON-delay time	odLY	0.0 (OFF) to 99.9s	0.0	s	
	Soft startup time	SoFt	0.0 (OFF) to 99.9s	0.0	s	
	SSR short circuit detection function	SSHt	OFF/ON	OFF		
	SSR open detection function	SoPn	OFF/ON	OFF		
	Heater layer short circuit detection function	HrSt	OFF/ON	OFF		

Mode	Parameter name	Parameter	Setting range	Initial value	unit	Set value
SET	Heater layer short circuit alarm level	HrAL	Varies depending on the model. K8AC-H21_ _ 0.200 to 2.200 K8AC-H22_ _ 2.00 to 22.00 K8AC-H23_ _ 20.0 to 200.0	The initial value varies depending on the model. ∗3 K8AC-H21_ _ 2.000A K8AC-H22_ _ 20.00A K8AC-H23_ _ 200.0A	A	
	Heater control method ∗1	hSmd	PH1/ PH3/CYCL	PH1		
	Continuously displayed measurement value	dSEL	CT 1 CT 2	CT 1		
	Power save operation	PSmd	OFF/ON	OFF		
	Power save operation time	PStm	10 to 300s	60	s	
	Display method	dSmd	NORM/ CMP/BAR	NORM		
	Display refresh	dSrF	0.2s/ 0.5s/ 1.0s/ FAST	0.5	s	
	Unit number	U no	0 to 64	0		
	Baud rate	bPS	1200/ 2400/4800/ 9600/19.2k	9600		
	Data length	LEn	7/8	7		
	Stop bits	Sbit	1/2	2		
	Parity bit	PrtY	EVEN/ ODD/NONE	EVEN		
	Gate OFF output hold time ∗2	GoHt	0 to 999s	2	s	

Mode	Parameter name	Parameter	Setting range	Initial value	unit	Set value
SET	Number of CT passes 1	nCt 1	1 to 99	1		
	CT ratio 1	Ctr 1	1 to 999	1		
	Setting 1 for number of effective digits to be displayed after the decimal point	ndP1	1 to 3	3		
	Number of CT passes 2	nCt 2	1 to 99	1		
	CT ratio 2	Ctr 2	1 to 999	1		
	Setting 2 for number of effective digits to be displayed after the decimal point	ndP 2	1 to 3	3		
	SSR ON delay	SdLY	0.0(OFF) to 99.9s	0.2	s	
	SSR operation gate current level	SGLu	4.0 to 20.0mA	7.0	mA	
	Cycle time	CYCt	0.2 to 3.0s	0.2	s	
GATE	Operation gate current level ∗1	G-Lu	7.0 to 20.0mA	7.0	mA	

∗1. K8AC-H2_P_-FLK only
∗2. K8AC-H2_C_-FLK only
∗3. See 5-86

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Cat. No. N159-E1-01 1113